THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIII. No. 1622.] LONDON, JUNE 12, 1894. [46TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

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'Killskale Fluid'

For preventing Scale and Incrustation in Boilers.

Guaranteed to contain no injurious Chemical

WRITE FOR SAMPLES.

JAS. MILNE COOPER & CO.,

Bradford, Yorks.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
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W. RICHARDSON, Fitter.

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PARKER & LESTER,

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Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

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Special Quotations to Gas Companies.

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THE "C" BURNER.

NEW HIGH-POWER GAS-LIGHT.

INCANDESCENT GAS-LIGHT SYSTEM.

Consumes 3¾ cubic feet per hour.

Gives a light of 70 to 80 candle power.

Brilliant Light.

Perfectly Steady and Noiseless.

Smokeless.

Reduced Heat.

The Ordinary Burner, with Special Globes, is suitable for Lighting Private Houses, Public Houses, Restaurants, Shops, &c.

Special Lamps constructed for Outside Lighting and Street Lighting; and Large Clusters of Lights made for Lighting Halls and large Areas from one centre.

Can be attached to any Gas-Fittings.

THE TRIUMPH OF GAS OVER ELECTRIC LIGHT.

Taking Gas at 3s. per 1000 cubic feet and Electric Light at 8d. per Board of Trade unit, the "C" Burner will produce an equal amount of light at **One-eighth the cost of Electric Light.** This cannot be disproved.

Substantial and Pushing Sole Agents wanted in each Town using Gas.

For Terms and Particulars, apply to the Manager of

THE INCANDESCENT GAS-LIGHT COMPANY, Ltd.,

14, PALMER STREET, WESTMINSTER, LONDON,

Near St. James's Park Station.

CASH PREPAYMENT METERS.

THE "POSITIVE" PREPAYMENT-SLOT-METER.

Noted for Strength and Simplicity of Construction.

Used by many Corporations and Gas Companies.

Material and Workmanship of the best.

Prices and full Particulars on application.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
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Special Bricks for Intense Heats.

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Retort Setters sent to any part of the Kingdom.

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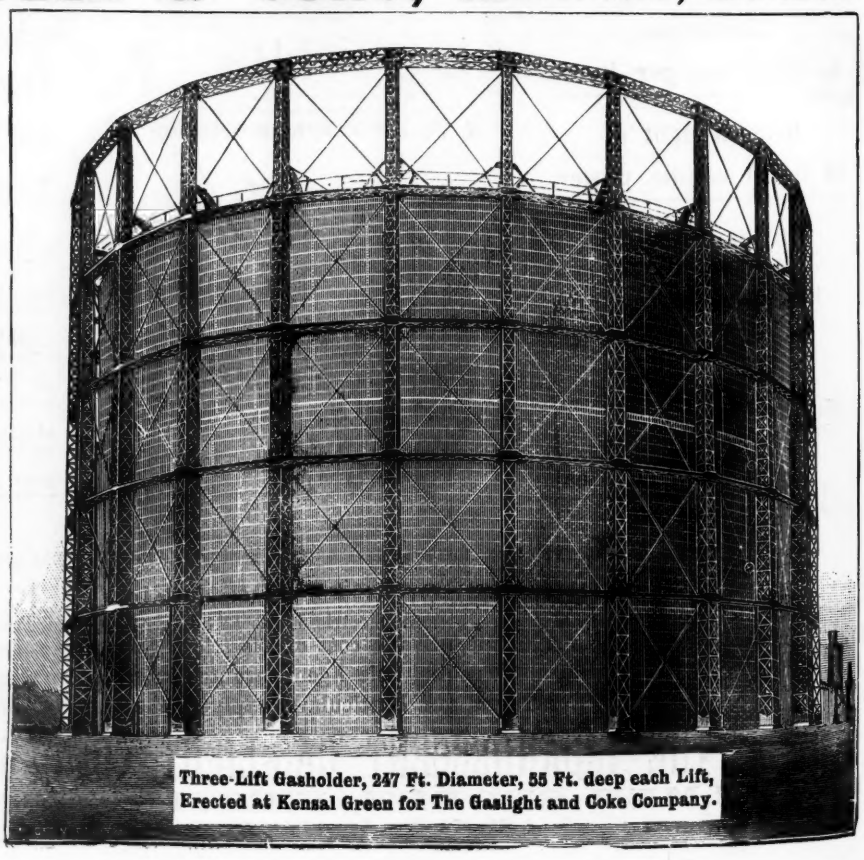

Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

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Telegraphic Address: "GASOMETER."

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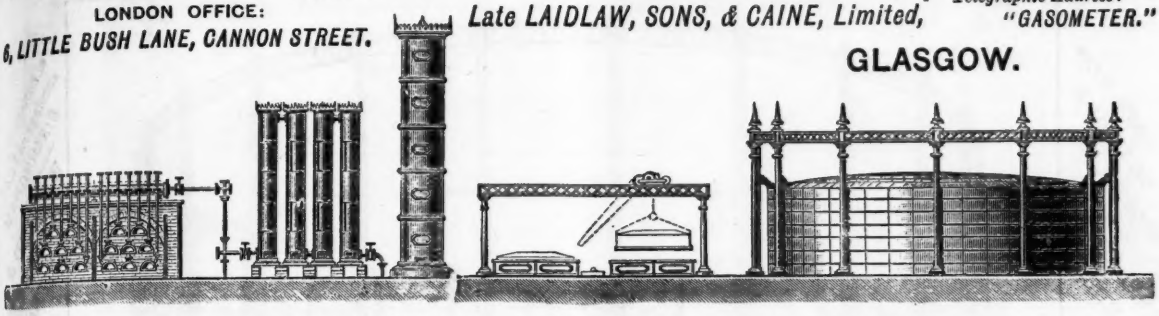

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RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
PURIFIERS, WITH PLANED AND CEMENT JOINTS;
DRY AND HYDRAULIC CENTRE-VALVES;
HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
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STATION METERS; GOVERNORS; SCREW AND RACK VALVES;
FOUR-WAY COCKS AND HYDRAULIC VALVES;
CAST-IRON GAS, WATER, & STEAM PIPES & CONNECTIONS; WROUGHT-IRON TUBES & FITTINGS;
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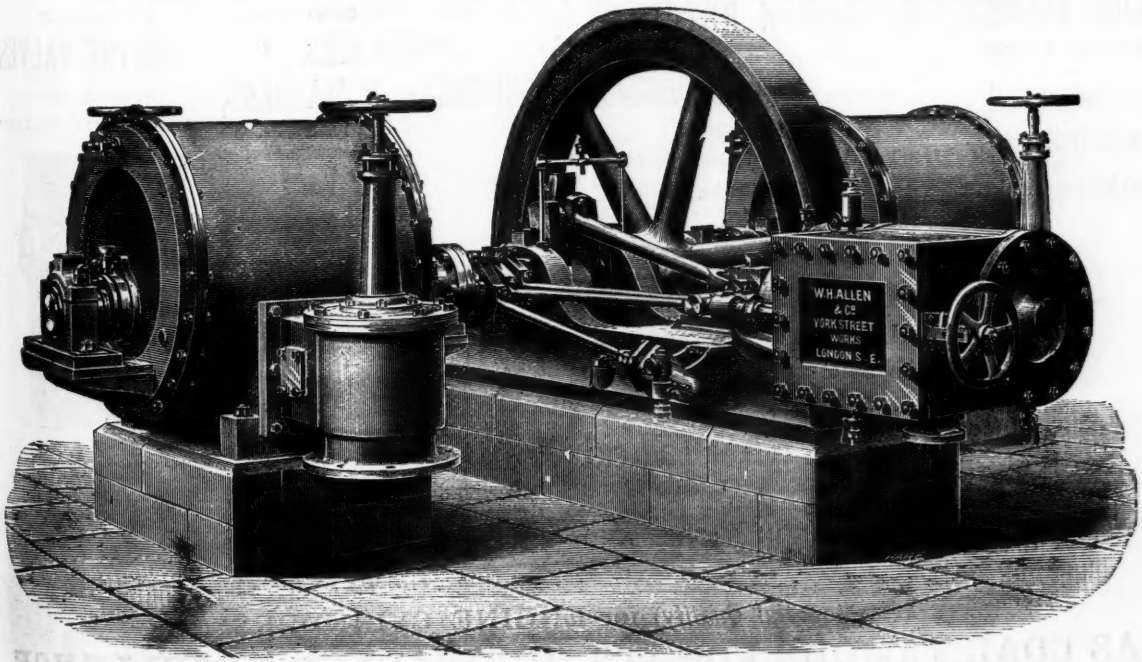
BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

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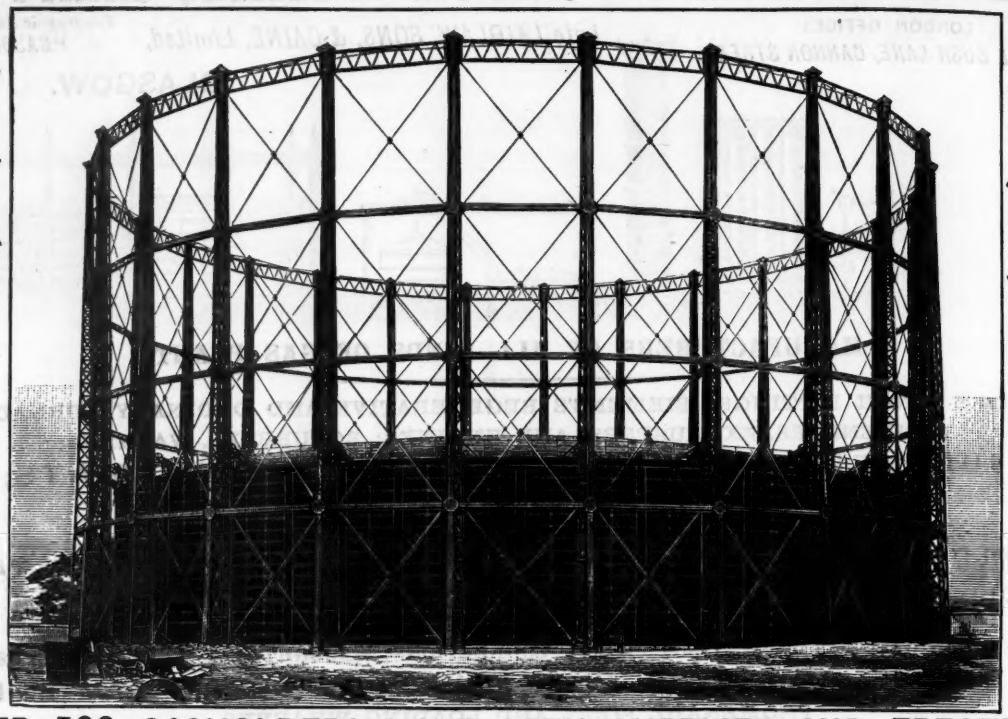

TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED GAS-HOLDER TANKS, PURIFIERS, PIPES, MAINS, RETORT-LIDS, WROUGHT & CAST

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

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BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
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REAL OLD SILKSTONE GAS COAL,

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NEWTON, CHAMBERS, & CO., LIMITED,

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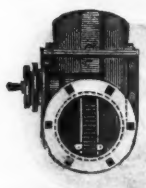
MANUFACTURERS OF

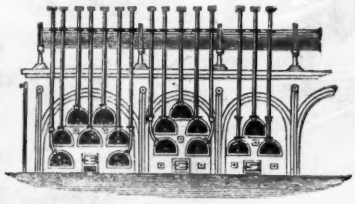
SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes, GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS, RETORT-BED FITTINGS, *And Retort-House Appliances* of every description, Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS, TAR AND LIQUOR PUMPS, &c.

PATENT CENTRE-VALVES for working Purifiers, Also Bye-Pass & Stop Valves.





PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

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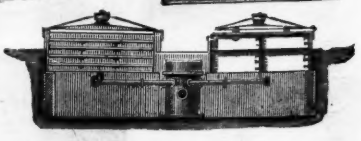

DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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GAS-WORKS CONTRACTORS, STOCKTON-ON-TEES.

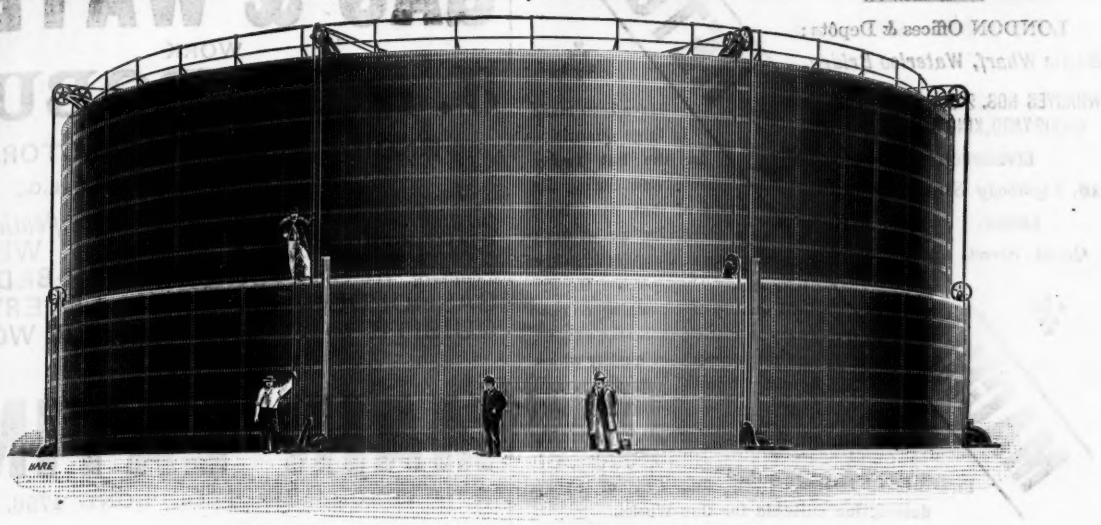

Illustration of BATHURST Holder, 82 feet diameter by 18 feet deep each Lift.

GASHOLDERS ON THE WIRE-ROPE SYSTEM

SUPPLIED TO THE FOLLOWING CORPORATIONS, COMPANIES, AND WORKS AT

MANCHESTER (4 Holders).	HASLINGDEN.	HARROGATE.	BIRKENHEAD.
NOTTINGHAM (4 Holders).	DARLINGTON.	SHEFFIELD.	SLIGO.
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HORSENS (DENMARK).	TYNE DOCK.	DENTON,	AND MANY OTHERS
MILAN (ITALY).	NEWBURN.	ASKE,	IN AMERICA.

LONDON OFFICE: 15, VICTORIA STREET, S.W.

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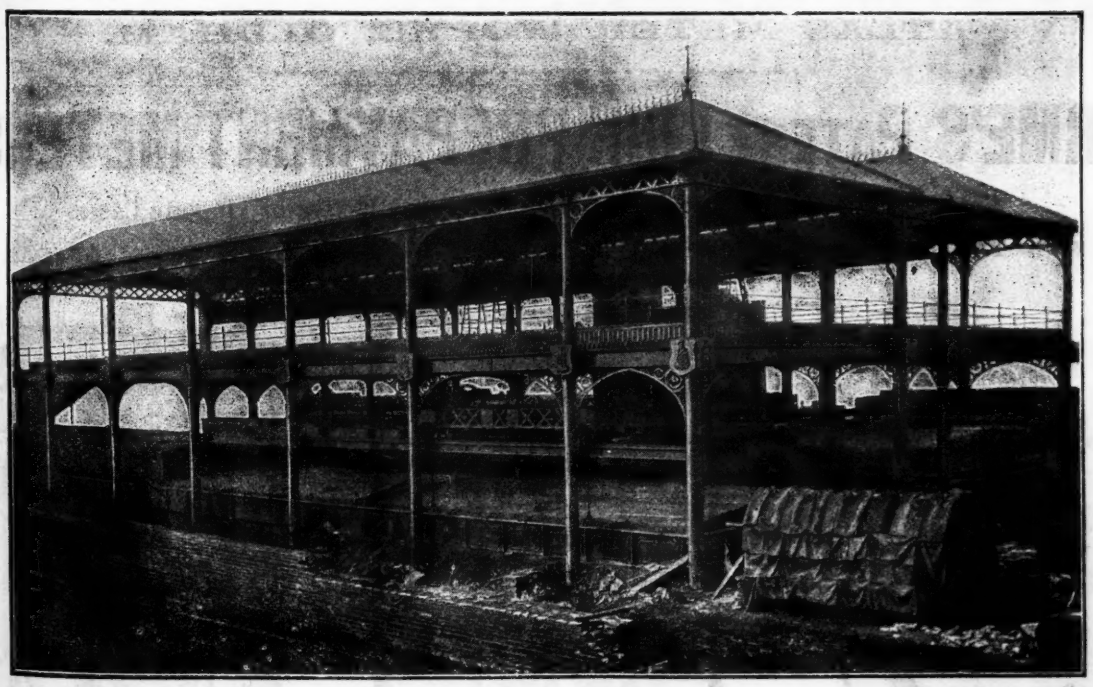

Purifier-Houses erected at Huddersfield to designs by Mr. W. R. HERRING.

Makers of Retort Ironwork, Condensers, Patent Scrubber-Washers, Purifiers, Gasholders of all sizes, and Gas Plant and Constructional Ironwork of every description.

Works: HUDDERSFIELD.

Telegrams: "Holmes, Huddersfield."

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INCORPORATED IN
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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

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GAS & WATER WORK

J. & H. ROBUS,

ENGINEERS & CONTRACTORS,
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furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

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Wrought-Iron TUBES And Fittings and Accessories.

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MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS GAS-VALVES, STEAM & WATER VALVES TOOLS, &c. AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
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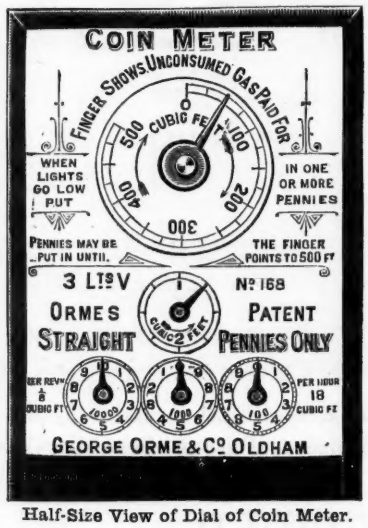
ORME'S PATENT COIN PREPAYMENT METERS.

Wet Meters in Cast-Iron and Tinplate Cases. Dry Meters in Tinplate Cases.

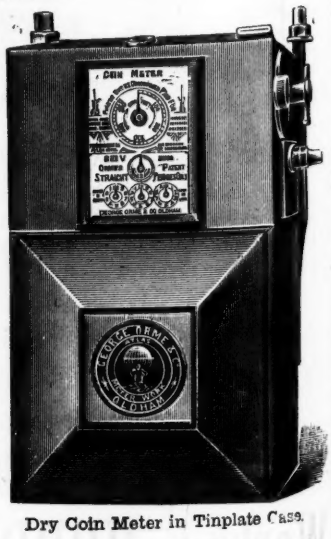
NEW PATENTED ARRANGEMENT FOR ALTERING THE SELLING PRICE OF GAS.

Full Particulars sent upon Application.

Wet Coin Meter in Tinplate Case.


COIN METER
FINGER SHOWS UNCONSUMED GAS PAID FOR
WHEN LIGHTS GO LOW PUT
IN ONE OR MORE PENNIES
PENNIES MAY BE PUT IN UNTIL
THE FINGER POINTS TO 500 FT
3 LIGHT ORMES STRAIGHT
No 168 PATENT PENNIES ONLY
GEORGE ORME & Co OLDHAM

Half-Size View of Dial of Coin Meter.



Dry Coin Meter in Tinplate Case.

Telegraphic Address: "ORME, OLDHAM." A.B.C. Code (4th Edition), used. National Telephone: No. 93, Oldham.

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C. & W. WALKER,

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MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

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PURIFIERS with Planed Joints.

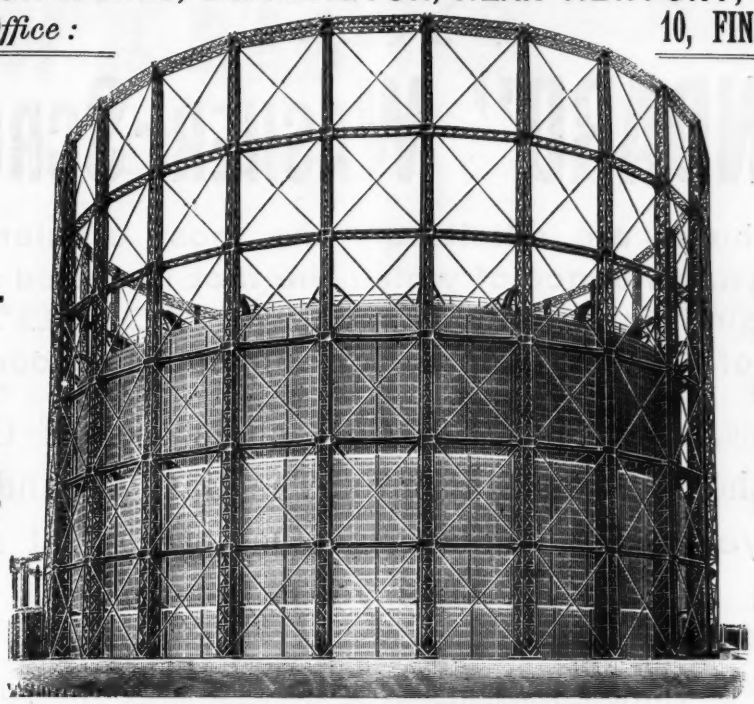
TOWER SCRUBBERS.

PURIFYING-MACHINES FOR AMMONIA.

CONDENSERS.

TAR PLANT.

SULPHATE OF AMMONIA PLANT.



GASHOLDERS.

WASHERS.

WASHER-SCRUBBERS.

CLAUS' SULPHUR-RECOVERY PLANT.

CENTRE & FOUR-WAY VALVES.

RETORT-MOUTHPIECES.

SLIDE-VALVES, TAR-BURNERS, SIEVES, &c., &c., &c.

The above is a view of the largest Gasholder (four-lift) of The Gaslight and Coke Company, Beckton, containing 8 million cubic feet, erected by us in 1892

Sole Makers of **WECK'S** Patent CENTRE-VALVE, & **CRIPPS'** Patent HYDRAULIC MAIN VALVE.

THE WHESSOE FOUNDRY CO., LTD., DARLINGTON.

Established 1790.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS PLANT,

FROM

RETORTS

TO

GASHOLDERS,

FOR WHICH THEY HAVE THE NEWEST AND MOST MODERN MACHINERY.

GASHOLDERS CAN BE MADE OF ANY DIAMETER AND PUT TOGETHER AT THE WORKS.

Holders having a capacity of **7,000,000** Cubic Feet have been made and erected; the largest one being 181 feet diameter by 136 feet 9 inches deep. Riveted entirely with $\frac{3}{8}$-inch diameter Hot Rivets.

WE ERECT GASHOLDERS EITHER WITH OR WITHOUT FRAMING.
NO ROYALTIES TO PAY FOR SPIRAL GUIDES OR WIRE-ROPES.

SOLE MAKERS OF

COATES' IMPROVED PATENT FURNACE DOOR PROTECTOR

Which has been approved and adopted by the Gas Authorities at

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KIRKHAM, HULETT, & CHANDLER'S,

PATENT LIMITED,

"STANDARD" WASHER-SCRUBBERS

These Machines are admittedly the most efficient of any in the Market, as evidence of which the fact is stated that 476 of them, equal to a daily capacity of 459,972,000 cubic feet of Gas, are in operation or in course of construction.

4 Machines, each for 3,500,000 cubic feet of Gas per day, erected at the Beckton Station of The Gaslight and Coke Company last year; 2 similar Machines erected at same Works this year.

Machines in hand for Silvertown, Devonport, Dorking, Accrington, Berlin, Marlborough (U.S.A.), &c.

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THE AUTOMATIC GAS-METER CO., LTD.,

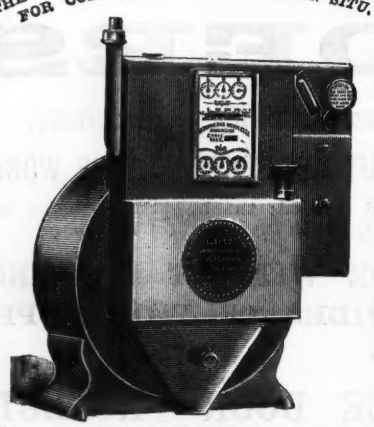
UPPER BROOK ST., MANCHESTER.

SOLE PROPRIETORS OF

THORP, MARSH, AND HAYNES' PATENTS.

PENNY-IN-THE-SLOT GAS-METERS.

THE AMOUNT OF GAS GIVEN IN EXCHANGE FOR COIN CAN BE ALTERED *IN SITU*.



The persistent efforts of the Inventors of our Meters have been crowned with

SUCCESS.

There can be no two opinions on the question of the priority of our claim to the consideration of Gas Companies as *the First* Introducers, on a Practical Scale, of a Penny-in-the-Slot Meter.

THE AMOUNT OF CASH PLACED IN THE BOX IS RECORDED. THIS IS A COMPLETE CHECK AGAINST FRAUD.

PENNY-IN-THE-SLOT GAS-METERS.

So long ago as 1889, we advertised our Penny-in-the Slot Meters as having the now fully-recognized advantage of ability to alter IN SITU. Automatic Meters without Coin-Counting Index are liable to be tampered with.

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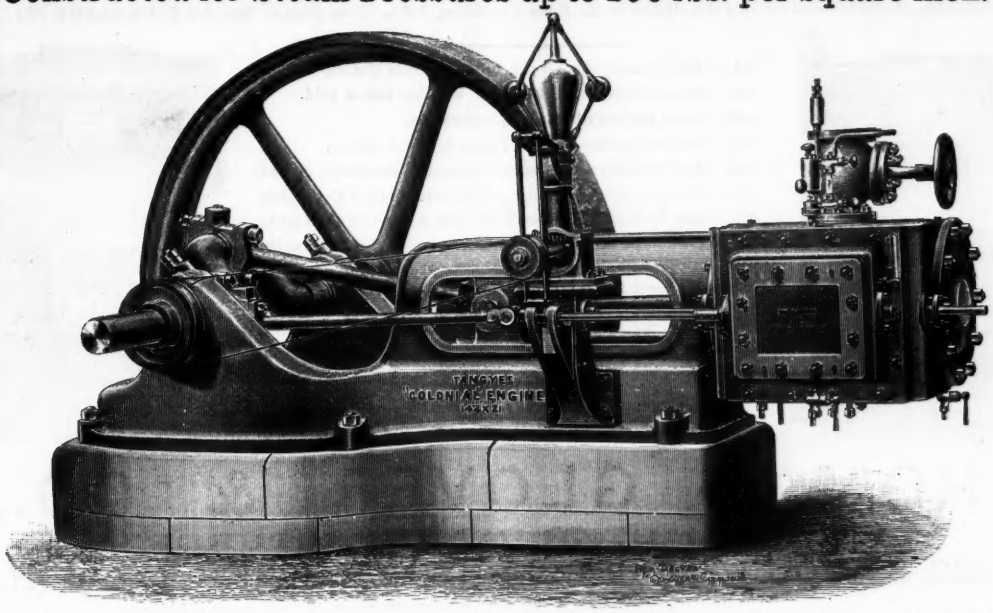
MANCHESTER: UPPER BROOK STREET.

LEEDS: 5, MERRION STREET.

TANGYES'
"COLONIAL" STEAM-ENGINE

Constructed for Steam Pressures up to 100 lbs. per square inch.



Tangyes' "Colonial" Steam-Engine, with the TANGYE-JOHNSON PATENT AUTOMATIC CUT-OFF GEAR. From a Photograph of the 14½ in. by 1 in. size.

PRICES QUOTED ON RECEIPT OF THE NECESSARY DATA.

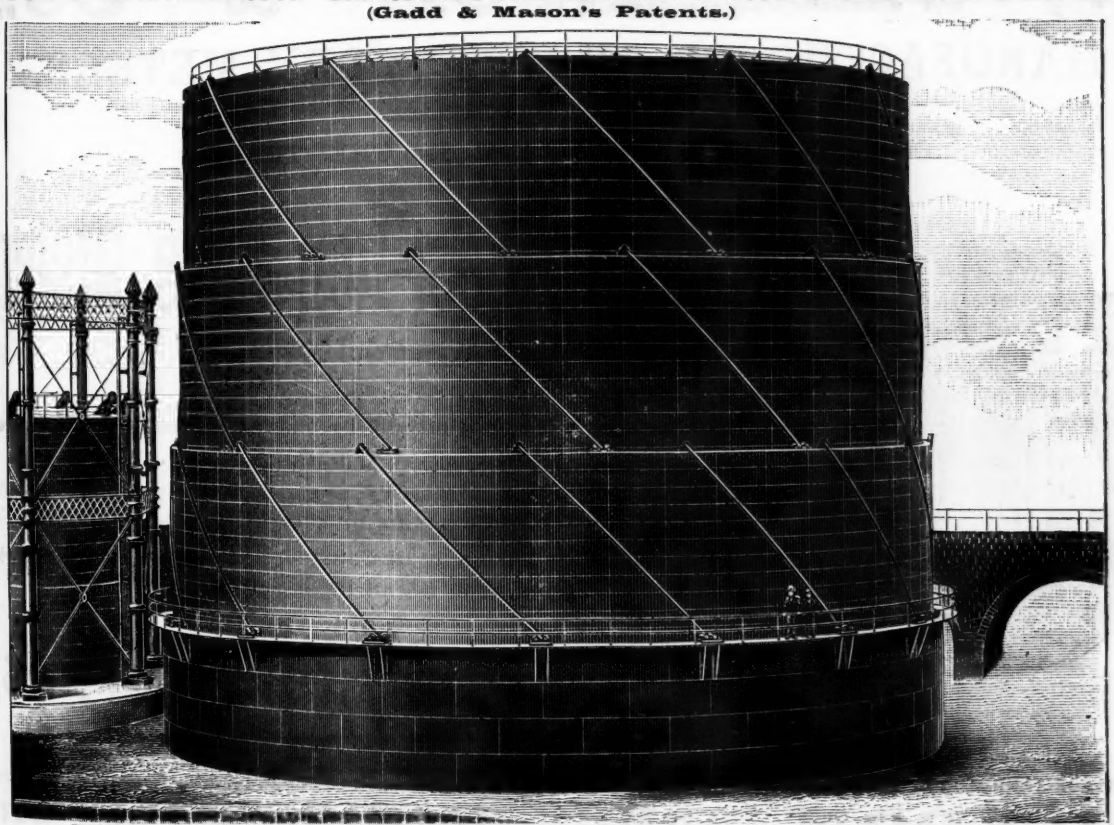
TANGYES LIMITED, Cornwall Works, BIRMINGHAM.

AND LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, BILBAO, ROTTERDAM AND CALCUTTA.

Telegrams: "TANGYES BIRMINGHAM." *Copyright. Entered at Stationers' Hall. No. 69 E.*

COLUMNLESS GASHOLDERS WITH SPIRAL GUIDES

(Gadd & Mason's Patents.)



Three-Lift Gasholder in Steel Tank. Outer Lift 100 feet diameter, by 24 feet deep. Recently erected at the Gas-Works, Chester.

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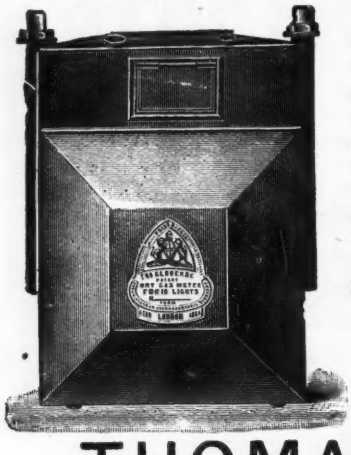
Newton Heath, MANCHESTER. London Office: 181, Gresham House, Old Broad Street, E.C.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

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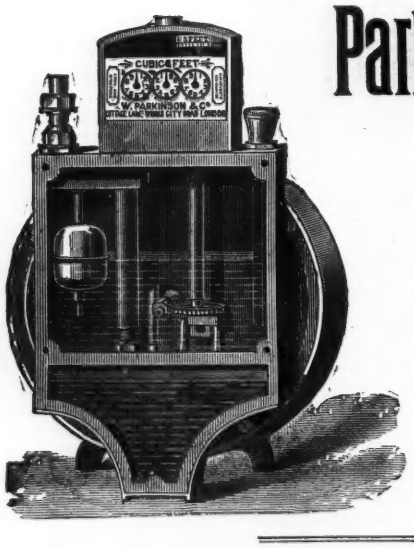

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[See also Advt., p. 1148.

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THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 12, 1894.

Mr. J. Chamberlain on Municipalism.

IN the current number of the *New Review*, Mr. Joseph Chamberlain, M.P., publishes a brief essay on "Municipal "Government" which is very well worth reading. In some respects it is a repetition of the views of the distinguished writer respecting the differences between English and United States Municipalism which have already found expression in an American magazine. The repetition, however, serves to emphasize the author's conclusion that in municipal matters, as in most other affairs of life, "so "very much depends upon the style in which it's done." Mr. Chamberlain lays stress upon the truth, which is liable to be overlooked in this age of government by phrase, that it is not enough to place the management of affairs in the hands of the people themselves in order to ensure the proper conduct of local business. It seems an elementary proposition that there may be worthless and corrupt municipalities as well as worthy and prudent ones; yet Mr. Chamberlain—ex-Mayor of Birmingham and ex-Chairman of the Gas Committee of the Corporation—has found it necessary, with a view to the education of public opinion to the appreciation of this aspect of Municipalism, to address himself to a critical investigation of the comparative cost of local administration in the United States and Great Britain. Without going into details, he now asserts "that while the advantages reaped "from municipal enterprise are certainly less apparent, the "average expenditure per head of the population is from "four to five times as great in the former as in the latter "country." This excessive expenditure cannot be accounted for by reference to the difference in the rate of wages; and Mr. Chamberlain does not believe that there exists any such organized corruption on the part of the authorities or the officials as would explain this extraordinary contrast. He makes an attempt to explain it, however; and the explanation is of the highest interest for English as well as American students of Municipalism. It is with him a question mainly of officials, their character, engagement, and emoluments. He insists upon the paramount importance of keeping the appointment of permanent municipal officers apart from all other considerations besides those of personal character and efficiency. "They "should be practically outside politics; refraining altogether from party movements, or public manifestation of "their political preferences. This is, in fact, an essential "corollary of their irremovability; for if they were to "make themselves the active partisans of one political "party, it would not be likely that they should be suffered "to remain when their opponents in turn obtained a "majority." Mr. Chamberlain might well have gone even farther, and pointed out the desirability, in their own interests, of corporation officials keeping clear of all cliques and cabals in the public bodies they serve.

The point on which we are most heartily in accord with Mr. Chamberlain is his insistence upon "the necessity of "offering adequate remuneration to those officials upon "whom great responsibility is thrown, and from whom "the highest qualifications should always be required." Every word uttered by Mr. Chamberlain upon this subject ought to be dinned into the ears of those whom it may concern. "Popularly elected bodies," he truly remarks, "are apt to be parsimonious in dealing with the upper "ranks of the servants they employ. A workman with "30s. a week, or a small shopkeeper with £100 or £200 "a year, cannot understand the necessity or propriety of "paying a town clerk or a chief engineer £2000 or £3000 "a year. He is very ready to be liberal, and even "generous, in dealing with the wages of manual or unskilled labour; but he does not appreciate the exceptional value of special technical gifts and professional "experience. . . . He is aware that hundreds are "ready to take the post for a tenth of the remuneration; "and he forgets that a single mistake or act of carelessness "on the part of a high official may cost the community "many times as much as the whole of his salary." The conclusion follows that, as Mr. Chamberlain remarks, the first, and perhaps the greatest, danger to be guarded against in the future of municipal institutions, is the deterioration of that great class of permanent officials, whose independence, trustworthiness, and loyalty are now a just source of pride to Englishmen, and constitute the best security for the lasting value of our local government. We rejoice to find so powerful a voice on the side of the cause which, through good and through evil report, has always been advocated in these columns; and we can only hope rather than expect that these counsels will take root and bear fruit where they are most wanted.

The Mistakes of the Council of The Gas Institute.

IT is not often that anybody takes the trouble to discuss in our "Correspondence" columns the report of the Council of The Gas Institute; and therefore the fact that a member has sent us a letter supporting our views of

some of the propositions of the report actually awaiting consideration at the coming meeting, is to be commended to the attention of the Council. The more the proposition to commit the Institute to take up such work as that performed by the defunct Gas Companies' Association is thought about, the more fatuous does it appear. Duties of this kind are altogether outside the scope of an association of gas managers. They must be paid for by the interest that benefits by them. But a still weightier consideration that may be urged against the meddling of The Gas Institute in such an affair is the certainty that nothing of the kind that could be started under the auspices of the Institute would command the general support which is indispensable to the success of any such organization. Neither The Gas Institute nor the Institution of Gas Engineers could hopefully undertake the duties which an independent association for the protection of the statutory gas industry of the country would have to discharge. As well might one of these bodies essay to usurp the work of the Association of Sulphate of Ammonia Manufacturers. If the Council of The Gas Institute cannot withdraw this portion of their report, they will be well advised if they let it be understood that nothing more will be done in the matter. Whatever obligation they may have incurred in regard to Mr. William Livesey can easily be liquidated. With respect to the new membership certificates, any notion that may have existed in some quarters as to the general acceptability of these bits of pasteboard or vellum must vanish when it is understood that they are to be paid for by those desiring to have copies. Not having seen this specimen of the copperplate engraver's art, we are unable to say whether or not, upon its artistic merits, it is worth the price it is intended to charge for it; but merit of any other kind it certainly does not possess.

Last Week in Parliament—The Preston and Ambleside Bills.

THE work of Parliament for the past week in respect of gas matters comprises the passing through the Commons Committee of the Preston Gas Company's Bill, with some alterations, and the rejection of the Bill of the Ambleside District Gas and Water Company. This latter was a misfortune for the Company, who have spent a good deal of money in attempting to obtain statutory protection, and now find themselves in no better, if not actually in a worse position. They have our sympathy. As to the Preston Company, they may fairly be congratulated upon the manner in which they have come through the ordeal of a six-days fight. Their case is an important one; and there is much instruction to be gained from their experience. Their previous Act dates from 1879, when their capital was fixed at £360,000 in shares or stock, and £90,000 by way of loan. They came to Parliament for new 7 per cent. stock to the amount of £200,000; and borrowing powers in the proportion of one-fourth of the new issue. Nothing was said in the Bill about the sliding-scale; and an important part of the Company's scheme was the acquisition of a site for new works, with railway access, in connection with which running powers were desired over certain Corporation sidings appertaining to the Ribble Navigation and the Preston Docks. In the end, the Committee sanctioned the proposal to purchase the selected site; but disallowed the provisions as to the railway and running powers. The amount of new capital was fixed at £120,000, to be raised at 5 per cent. The sliding-scale was inserted, with the consent of the Company, upon the "neutral zone" principle; the initial price being fixed at from 2s. 11d. to 3s. 3d. per 1000 cubic feet. A controversy respecting the burner to be used in testing was settled in accordance with the views of the Company. For some inscrutable reason, the Company wished to be authorized to apply for a Provisional Order under the Electric Lighting Acts; and this has been nominally accorded to them. On the whole, therefore, the Company came off very successfully; but it is certainly a pity that they could not obtain the railway facilities they desired in connection with the new site. As to this point, however, the door is not closed upon amicable negotiations with the Corporation, who will find it to their interest to assist the Company in every way that leads to a reduction in the cost of gas making.

Mr. De Segundo on Gas Power.

A VERY instructive paper on "Power Distribution by Electricity, Water, and Gas" was read on the 4th inst. before the Society of Engineers, by Mr. E. C. de Segundo; and an abstract of it will be found in another column. Upon the branch of the general subject which is most interesting to our readers—the question of the distribution of power by the agency of gas—Mr. De Segundo offered some observations which show that he has studied the matter from an independent standpoint. Speaking of the competition, such as it is, of electric lighting with gas for the favour of the public, the author gives it as his opinion that "the convenience of gas for lighting and heating are "apt to be overlooked because of our familiarity with "them." This is true; but he goes on to remark that "had we experienced the inconveniences of oil and candle "lighting, I feel sure the electric light would not have made "so much progress as it has done." This is a dark saying, the key to which is not readily come by. The author seems to have left out the connecting-link which should have led his readers from the one sentence to the other. The transit was evidently both easy and natural for himself; but we cannot see how he made it. On the face of the statement, we should more naturally arrive at the directly contrary conclusion. As a matter of fact, moreover, it is pretty well known that where electric lighting has made most headway, it has been in substitution of oil and candles rather than as a supplanter of gas lighting. Thus, it has established itself on shipboard, and has become fashionable as an adjunct to country-house life and as an ornament for the drawing-rooms and boudoirs of town houses, where gas, if it ever penetrated, was relegated to the hall and servants' quarters. It is of more importance to note, however, that, like Mr. Denny Lane, Mr. De Segundo is a strong supporter of what he calls the "gaso-electric system of distribution." He makes out both theoretical and practical cases for the employment of gas to generate electric light, in preference to its direct consumption for lighting purposes; and so long as he will permit us to hold the belief that the strength of the gas industry lies in its suitability for lighting the vastly preponderating number of houses in all towns, in which the introduction of a dynamo and accumulator plant would be a farcical procedure, we will gladly support him in arguing that, if large shops, banks, &c., want electric lighting, they can be supplied with the luxury from their own gas-engine at about one-third of the cost of a similar supply derived from a central station company.

Water Gas in Massachusetts.

THE Ninth Annual Report of the Board of Gas and Electric Light Commissioners of the Commonwealth of Massachusetts has been issued, and an interesting publication it is; containing as it does a mass of information, of all sorts, respecting the working of the numerous undertakings carried on under the supervision of the Board. These now number 134 in all—some supplying only gas, others only electric light, and a few doing business in both kinds. The powers of the Board are very extensive—ranging from the largest to the smallest of the mutual concerns of gas and electric light suppliers and consumers; and from all that has transpired in regard to the manner in which these powers have been exercised, we believe that the Board has deserved well of the public. It is a despotic institution; but it cannot be denied that the maladministration of many of the undertakings put under its control cried aloud for some drastic remedy. If the Gas Companies of Massachusetts are now "governed too "much," they have brought this retribution upon themselves by an often selfish and greedy treatment of the gas consumers. It appears from the present report that the production of water gas is still extending in the State; three of the largest undertakings under the inspection of the Board having, during the past year, commenced to supply this kind of illuminating gas. Touching upon this subject, an interesting part of the work of the Board has always been the compilation of reliable information respecting casualties traceable to gas and electric supply. Mr. Paddon was pleased to refer to this aspect of the water-gas question jestingly at the recent meeting of the Institution of Gas Engineers; but the reports of the Massachusetts Commissioners show plainly enough that this is no laughing matter. It is the duty of the Board to report upon cases of bodily injury from gas and electricity manufactured and sold for light and fuel; but the complaint is made that little help is afforded in the performance of this duty by the various Companies, "as only a

"small percentage of the accidents seem to come to the "knowledge of these Companies." Certain particulars were nevertheless received from various sources of 52 "accidents" from illuminating gas in the State during the year covered by the report—one per week, a pretty fair average. Fifteen fatal cases of inhalation of gas occurred in hotels and lodging-houses; and at least three were cases of undoubted suicide. The declaration of the Commissioners upon this head is sufficiently grave. They say: "Since April 30, 1890, when the State took off the limit "of 10 per cent. from the amount of carbonic oxide allowed "in gas, the number of fatalities has increased alarmingly. "In 1889 there were two deaths reported by this Board; "in 1890, eight; in 1891, sixteen; in 1892, eighteen." The inference is tolerably clear; but the Commissioners are content to tell the facts, and do not draw a moral. In this prudent course we shall follow them; contenting ourselves with a repetition of the opinion we have frequently expressed, that a change in the composition of a gas supply consisting in the substitution of 30, or even 40, per cent. of carbon monoxide for 10 per cent. of the same component, is fraught with tremendous responsibility for those who take this course for merely commercial reasons.

How Random Strikes Might be Prevented.

THE results of the investigations of the Labour Commission seem to be leaking out in small portions, so that when the final report appears it will, in all probability, read like stale news, and so fail to make the impression upon the public that might have been expected of it had the counsels of the Commissioners been better kept. Only yesterday, the heads of what are styled "Supplementary Observations" to the actual majority report were made public in the daily newspapers—the report itself being still withheld. In these observations, the Chairman and several Commissioners deal with the various suggestions that have been made with a view to secure the observance by both sides of industrial agreements. It is admitted to be one of the weaknesses of all proposals for the creation of Boards of Conciliation and Arbitration for the amicable settlement of labour disputes, that there are no means of enforcing the decisions of such bodies. With a view to overcoming this difficulty, the Duke of Devonshire and those of his colleagues on the Commission who think with him upon this matter, propose that the Trades Unions and Associations of Employers should be permitted to assume the legal personality which they do not now possess. At present these societies exert collective action without collective responsibility. The proposal, therefore, is that they should be allowed, if they so desire, to acquire the full rights and responsibilities of corporations, including the power to sue and be sued. If this were done, it is suggested that the terms and conditions under which any industry was carried on would be the result of formal agreement between the corporations representing respectively the employers and the employed, breach of which would be capable of being sued upon by the party injured. The idea is that the prospect of this, although it could not prevent, would render such practices less likely. Thus the problem of how to give powers of procedure to voluntarily-formed Boards of Arbitration, and a legal sanction to their awards, would be solved by the operation of the ordinary law as to agreements made between parties capable of contracting. These suggestions are undoubtedly clever; but we have not yet had time to consider them with sufficient care to form an opinion in their regard. We shall wait for the publication of the authorized documents before undertaking to discuss this or any other point of the Commissioners' conclusions.

Dr. Percy F. Frankland, F.R.S., Professor of Chemistry at the Dundee University College, has been appointed by the Council of Mason's College, Birmingham, to the chair of Chemistry and Metallurgy, vacant through the resignation of Professor Tilden. The gas and water industries are both indebted to Dr. Percy Frankland for many valuable researches, records of which will be found in the volumes of the JOURNAL. His labours in connection with the bacterioscopic examination of water, in which he has had the valuable co-operation of Mrs. Percy Frankland, have been embodied in a volume lately published, which we hope to notice in detail in an early issue. We heartily congratulate him on his appointment, which cannot fail to afford him further scope for the exercise of his special abilities.

WATER AND SANITARY AFFAIRS.

BY the Thames Conservancy Bill, it was proposed that the six Metropolitan Water Companies drawing from the Thames, including the East London, should in future contribute a sum of £29,750 per annum to the funds of the Conservancy. This has generally been treated as an addition of £13,000 to the annual payment already made; and it was spoken of as such by Mr. Littler, when representing the Conservators before the Select Committee. But this estimate seems to require that we should ignore the sum of £1450 paid annually by five of the six Companies under certain agreements entered into when the Corporation were the Conservators of the Thames. The present Conservators, in a statement which they laid before the recent Royal Commission, reckoned all the contributions under the Act and by agreement; thus making the total amount £17,950, including £2000 from the East London Company, as the sixth on the list. On this basis, the increase proposed by the Bill becomes £11,800. The Select Committee having decided that the increase should only be £7500, making the total payments £25,450, the Thames Conservators, by their Counsel, proceeded a few days ago to rearrange their scale. At the present time, three of the Companies are paying £3300 each; the Lambeth, £3250; the Chelsea, £2800; and the East London, £2000. This will now be altered, so as to make up the enlarged total. After dealing with this question of the contributions, the Select Committee have taken into consideration the clauses which propose an extension of the Conservators' jurisdiction with respect to the pollution of the Thames. Having extended this jurisdiction to the entire catchment area of the river, the next question has been as to the proper constitution of the Conservancy, so as to correspond to the enlarged area. The Bill provided for various interests to be represented on the Board, but entirely excluded the Water Companies, who nevertheless are called upon to contribute so largely to the revenue of this authority. If the purity of the stream is to be preserved, the Companies are specially qualified to assist in carrying out that function; and their right to be represented, as contributing largely to the pecuniary resources of the Board of Conservancy, seems quite equal to that of some other parties who are recognized. Apparently it is the intention of the Committee to allow the Companies one representative on the new Board. An enlargement of the number of Conservators proposed by the Bill is also contemplated; and the matter will come under further consideration to-day. The London County Council have sought to obtain a strong representation on the Board; but they will have to be content with some abatement of their claims. The enlarged area placed under the control of the Conservators, so far as relates to the prevention of pollution, and made to include the entire watershed of the Thames, is in accordance with the views advocated many years ago by Earl de la Warr, who urged the value of a true physical outline for a sanitary district, instead of the capricious boundary arising out of purely artificial considerations, chiefly of the parochial order. The only drawback is the magnitude of the body necessarily created to deal with what must often be a wide territory. But any ill results may be prevented by the institution of judicious regulations.

It is not easy to follow the reasoning of Justices Cave and Collins, who refused to grant the Todmorden Water-Works Company leave to appeal in an interesting case which was reported in last week's JOURNAL. The question which their Lordships were called upon to decide is of considerable moment, not only to the particular Company, but to other water companies throughout the kingdom; and, in the interests both of the companies and the public, it is desirable an authoritative rule should be laid down on the point at issue. Originally the case came before the County Court Judge of Todmorden—the plaintiff seeking to recover compensation in consequence of damage caused by an overflow from a flush-cistern. It seems the water from this cistern percolated through the different floors until it reached the basement of the house, where certain goods were stored, which, in consequence, suffered injury. So far as the plaintiff Company were concerned, their wrong-doing, if any, consisted in their inspector, who

found the cistern leaking, fixing a new washer, which, the defendants stated, allowed the tap to leak, with the result already stated. There was a leak before the washer was put in, and there was a leak afterwards; so that defendants did nothing to primarily give rise to the loss for which plaintiff claimed to be compensated. Moreover, the Company are not paid for putting in new washers. They supply them in order to prevent waste; and in this instance, unfortunately, that object was not attained. In these circumstances, however, it does seem rather a strange thing to draw an inference of negligence on the part of the Company or the Company's servant. Nevertheless, the County Court Judge gave judgment for the plaintiff; and now his ruling has been upheld by Justices Cave and Collins, who, as already mentioned, have refused to allow the Company to carry the case further. If the inspector had done nothing, of course the defendants would not have been responsible; but as he made an attempt to do something, voluntarily—that is to say, not in consideration of any money payment—and the existing leak was not checked, the Company are cast in damages. The learned Judges dealt with the question as one rather of fact than of law; and they allowed the claim on the ground that the Company had undertaken a duty which was negligently performed. But the question arises whether the Company did, in truth, undertake a duty, or whether, without accepting liability, they merely offered voluntary assistance, which, in this instance, proved to be of no avail. Apart from this, there would seem to be some ground for contending that there was at least contributory negligence on the part of the plaintiff; but this view also the Judges dismissed. We are certainly of opinion that these points deserve further consideration. If, as the plaintiff's Counsel urged, water companies are to be answerable for defective washers fixed by their workmen, who are not employed by the consumers, but simply go round for the purpose of stopping waste, it will unquestionably be a very serious matter, and vexatious claims for small acts of alleged negligence are likely to be largely multiplied. It is to be hoped that some other way will be found of raising this important question anew.

An ordinary Court of Law is manifestly an unsuitable tribunal for the trial of such complex questions, relating to the construction of extensive water-works, as are raised in the action of *Baldry and Another v. The Mayor and Corporation of Swansea*. The report of the recent proceedings before Mr. Justice Charles, which appeared in the last number of the JOURNAL, will have made it only too clear to the reader that the case must, in any event, have gone ultimately to an arbitrator. But what will strike some people as exceedingly unfortunate is that the every-day legal machinery had to be set in full motion, and some eight or nine "Counsel learned in the law" briefed to appear in the case (without any practical advantage to the litigants), before the matter could be sent to a referee. On the merits of the action, which involves a disputed sum of about £65,000, we, of course, do not express any opinion, for the matter is still *sub judice;* but it really would appear desirable that questions arising as to the carrying out of large public works, such as the water-works at Swansea in the present instance, should be dealt with at the outset in some convenient Court of Arbitration. The learned Judge expressed the opinion that it would be a waste of both time and money to try this particular case in "piece-"meal fashion;" but was it not a waste of both time and money to carry it into Court at all? It is true the case started with imputations of fraud which the Corporation and their Engineer strongly repelled; but, seeing that Sir Richard Webster, as Counsel for the plaintiffs, expressly withdrew all such imputations, the question arises why, if made, they could not have been withdrawn before. Better late than never; better earlier than so late.

Death of Mr. G. Eraut.—We regret to record the death, on Monday, the 28th ult., at the early age of 33, of Mr. George Eraut, Assoc.M.Inst.C.E., Manager of the Braintree and Bocking Gas-Works. Deceased, who was a native of Cambridgeshire, had been for some years associated—first as a pupil, and afterwards as an assistant—with Mr. Jabez Church, M.Inst.C.E., F.G.S., the Managing-Director of the Company, from whom he received the appointment at Braintree in 1892. During his short tenure of office, he effected various improvements tending to more economical production of gas. He was elected a member of the Eastern Counties Association in September last.

THE INCORPORATED INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE GENERAL MEETING,

HELD AT THE

INSTITUTION OF CIVIL ENGINEERS, MAY 9 & 10, 1894.

As already intimated, there was no time for the reading and discussion of the last paper on the *agenda* for the meeting. It was as follows:—

RELATION OF CARBURETTED WATER GAS TO THE EUROPEAN GAS INDUSTRY IN 1894.

By A. M. PADDON.

Carburetted water gas, upon a commercially important basis in this country, has only completed three years of its existence. Prior to this period its history consisted of some fifty years of intermittent experiment and trial, without result or adoption by which it could be regarded as an accredited factor of the stable and general gas process. A little over three years since, however, installations were effected in London upon a scale which rendered the exploitation of the system on which they were erected exhaustive and inevitable.

Novel as the departure was in its new sphere, the process had credentials from the United States of America, where its use already preponderated largely over that of coal gas; but circumstances and conditions varying between there and here, these data were very properly unaccepted as being conclusive in its favour. So this term of from 1891 to 1894 may be taken as the probationary period of carburetted water gas in Europe; and in this paper it is proposed to consider the outcome of this trial, and to define and appraise, as closely as possible, the result, and its relative importance to the gas industry in this country and on the Continent. As the writer has no knowledge of the existence, on a sufficiently important scale to call for notice, of any plants but those of one principle and system, it may be said here that this paper deals exclusively with the production of carburetted water gas upon the "Lowe" system. In the protracted warfare of contending systems in the United States, this process has secured such general adoption as evidenced in the fact that, of 40,000 million cubic feet of carburetted water gas produced annually on the American continent, 30,000 millions are manufactured upon the Lowe principle, and the extinction of alternative processes is being rapidly accomplished.

It would not be out of place here to briefly define the cardinal principle of that system; for it is only the general principle that now remains of public importance. The feature to which the Lowe process owes its distinctive economy and merit is that of conserving the energy of the producer gas, created in the intermittent action of an air-blast upon the fuel-bed, by regulated combustion in chambers filled with refractory material, for the purpose of gasifying and making permanent the hydrocarbon element from which the gas derives its ultimate illuminancy, in the presence of hot water gas simultaneously produced. The great economies thus effected may be said to have formed the groundwork of the commercial success of carburetted water gas. The accompanying plate* shows the embodiment of the principle in the latest form of apparatus.

The advent of the process here may be ascribed to the high cost of the enrichment of coal gas, necessary under certain legal standards of obligation. For compliance with such requirements, the use of cannel coal had up to that time been the common resource of the industry; and upon the price of cannel financial results were largely dependent. When, therefore, cannel rose in price, alternatives for its use were sought. Oil vaporized by itself, without the association of another gas as a vehicle and diluent, producing a small volume of very rich gas, has not met with a full measure of success, partly, perhaps, because a gas (say) of 50 to 90 candle power is even easier to acquire than to utilize, in connection with a large quantity of poor gas, for distribution.

*The illustration here referred to appeared in the JOURNAL for May 15 last, p. 909.

When carburetted water gas came to be considered, it was found to offer advantages beyond that of economical enrichment. In distinction from other processes by which gas was more or less successfully enriched, it had the capacity of gas production in large quantities, subject to nicety of control. It proved to be a gas maker and a gas enricher at the same time. Another recommendation was that it was dependent for one of its chief elementary materials on a bye-product of coal gas manufacture—viz., coke. Gas being saleable at a known price, the feasibility of converting coke at low prices into gas, promised profit and convenience. Then the fact came to be esteemed that the candle power of the gas leaving the plant could be varied to almost any desired extent (certainly from 18 to 40 candles) in a few minutes, and that the whole plant itself could be shut down in the same time, without considerable loss of material or labour, and could remain under such conditions for as long as desired, ready for sudden emergency or use. To all these facts, associated with the comparative independence of labour, and the use by the new gas of much existing plant in common with the ordinary coal gas, the initial adoption of carburetted water gas may be traced. But it was the cost—the actual economical efficiency of the process—that constituted the unknown quantity; and this to a great extent is now patent and ascertained.

The plant in its more recent forms, while preserving the main characteristics of the latest American pattern, and of the first English installations, has been modified in certain details in its adaptation to the treatment of the special fuel and oils here available. This has entailed certain new dispositions in the generator, superheater, and oil-heater. In cost, dimensions, and in its relations to the portions of the coal gas plant on which it depends in common with the latter product, no considerable change has supervened.

As to dimensions, the following figures are of interest: At the Beckton station of The Gaslight and Coke Company, a plant capable of producing 8 million cubic feet of gas per 24 hours, stands in a building 200 feet by 100 feet. This building contains boilers, engines, exhausters, blowers, pumps, washers, scrubbers, and condensers; the gas on leaving it having only to pass through the few purifiers necessary, to the meter and holders. At the Kensal Green station of the same Company, a plant of 4 millions maximum capacity stands on an area of proportionate extent, under the same comprehensive conditions. At Belfast, a plant equal to the production of $1\frac{3}{4}$ millions per diem stands, without its steam power and machinery, in a space of 60 feet by 31 feet. At Liverpool, the building designed to contain a plant to produce 5 to 6 millions per diem, occupies an area 165 feet by 90 feet. The Tottenham and Edmonton Gas Company are erecting a building 55 feet by 92 feet, for a plant with the ultimate capacity of from 1,200,000 to 1,400,000 feet per diem. At Brussels, an excess of accommodation has been provided by a house about 80 feet square for a plant of the same size as that last mentioned. At Copenhagen and at Glasgow, plants have been erected in disused portions of retort-houses, the area occupied by which would serve no purpose of comparison.

It is purposed here to take each of the component charges that go to form the final and inclusive cost of carburetted gas, and to consider them in turn. They are comprised in the following category: Oil; coke; water; labour; purification; and wear and tear and maintenance.

Oil.—Oil is the most important quantity of those under consideration. Under the most favourable conditions that can be realized, it is likely to form over 50 per cent. of the entire cost of the gas. The supply, from causes probably in a great degree due to the introduction of carburetted water gas, is better organized here than formerly, and depends for its sources upon so many different countries that it may be considered for contemporary purposes illimitable. Oils differ largely in their suitability for gas making; and variations of price must be reckoned on. It is, therefore, a leading feature of merit in a plant that it should successfully handle a large assortment of different oils, so that, at least, the fluctuation of markets may be taken advantage of. Providing the plant is designed with a proper margin of cracking and fixing surface, the successful treatment of the oil may be left to the experience and judgment of a competent operator. The accurate estimation of the actual amount of surface necessary, must be derived from practical knowledge of the oils and their behaviour. The European oils differ in some ways from the American oils, upon the known qualities of which the first English plants were designed; and the modification of the more recent plants, to meet these ascertained differences, accounts for the steady improvements in the results obtained.

Circumstances here have, up to the present time, favoured the use of a medium, or late, distillate of from ·840 to ·900 specific gravity, with a high flash-point at 100° to 260° Fahr. With such oils may be classed Solar, and Solar distillate (Russian), Massuth (Russian), Scotch shale, and certain exported American petroleums. The following results of candle-units per gallon, developed in different installations of the Lowe process, may be of interest. As a single method of indicating the efficiency of a process, this may be considered deceptive; for the candle-units may be obtained with varied proportions of volume to illuminancy. In the case cited, the conditions of working are afforded.

Candle-Units per Gallon developed by the Lowe Process.

—	Class of Oil.	Specific Gravity.	Candle-Units.	Illuminating Power.	Maximum Capacity of Plant.
				Candles.	
Beckton . .	Solar . . .	·870	1292	25·00	8,000,000
Kensal Green .	Solar . . .	·864	1451	20·10	4,000,000
	Solar distillate				
	Scotch . . .				
Copenhagen .	Solar distillate	..	1374	21·44	700,000
	American . .	..	1488	28·29	700,000
	Massuth . .	..	1478	23·51	700,000

Then as to the quantities of oil used. These, of course, furnish the leading criterions of the relative values of oils. The following results, acquired by workings on an extended scale, may be held as representative of the process:—

Gallons per 1000 Cubic Feet, with Illuminating Power, in the Lowe Process.

—	Class of Oil.	Specific Gravity.	Gallons per 1000.	Candles per Gallon.	Illuminating Power.
					Candles.
Beckton . .	Solar. . . .	·870	3·87	6·46	25·00
Kensal Green	Solar. . . .	..	3·49	6·56	22·89
	Solar distillate .	·864	2·77	7·20	20·10
	Scotch . . .	..	..	..	..
Copenhagen .	Solar. . . .	..	3·12	6·87	21·44
	American . .	..	3·80	7·44	28·29
	Massuth . . .	..	3·18	7·39	23·51

Generally speaking, any oil can be continuously handled that is free from residual carbon on fractional distillation to a less extent than 3 or 4 per cent.

Coke.—The use and conversion into gas of coke constituted, perhaps, prospectively one of the greatest attractions of the process to the English gas engineer. Coke very frequently owes its unsaleability, or depreciated value, to just that small excess of quantity which renders storeage difficult, and the market dull. To utilize this excess profitably, is to put a new value on the remainder. When by this practice a corresponding independence of coal supply is entailed, a strong case is established. When again the value of coke is enhanced, economy of use is required at once even from the process that stimulates its price.

Coke may be said to comprise the fuel available for carburetted water gas in this country, in contrast to a very common use of anthracite in America. The carbon energy of the average gas coke being inferior to that of anthracite, some modification of the plant based upon the use of the latter became necessary; hence better results in the later plants. The various qualities of gas coke, in different parts of the kingdom, call for the design of a plant with considerable latitude in this respect; but the successful handling of cannel coke, under suitable provision of design, would demonstrate the possibility of using to advantage almost any class of this residual.

The policy adopted in regard to tar materially affects the fuel economy of a plant. In some cases the tar produced, averaging in quantity about $\frac{1}{2}$ gallon per 1000 cubic feet of 24-candle gas, can be sold locally at a higher rate than coal tar. Sometimes it can neither be sold nor given away. In the latter event, it can be entirely consumed by a simple method under the boilers; and the fuel account is reduced to the extent of its equivalent.

Figures for fuel, unless relating to sufficiently protracted

periods, are worse than deceiving. The subjoined may be taken as of an average character—

Coke Used per 1000 Cubic Feet by the Lowe Process.

	Pounds per 1000 Cub. Ft.	Illuminating Power of Gas.
Beckton	50·0	25·00 candles.
Kensal Green	50·0	20·10 ,,
Copenhagen	44·3	21·44 ,,

Water.—The amount of water required, over and above that used in the boilers, is not very considerable. That supplied to the condensers, not being in actual contact with the gas, can be circulated continuously through a cooling tank; and that used in the scrubbers, washers, and seals, can be circulated separately—the greater portion of the tar separating by gravitation. The quantity of water used per 1000 cubic feet differs so very little, that the common figure of 10 gallons per 1000 cubic feet may be safely accepted.

Labour.—Labour, one of the chief economies of the process, is practically a constant item of cost in most parts of the United Kingdom when considered at per 1000 cubic feet. The continual labour of five men can operate a plant up to the size necessary to produce 1½ millions per 24 hours. To this charge must be added the occasional changes of purifying vessels, if distinct vessels are used; an item for superintendence; and the charges due to maintenance and repairs. The simplicity of the process would hardly qualify the use of the term "skilled" in connection with the labour employed. As a general charge, 1½d. per 1000 cubic feet will be found ample.

Wear and Tear and Maintenance.—The figures afforded in the early estimates and projects appeared so small in comparison with those of coal gas that they did not secure general acceptance. However, the dimensions of the plant, its compact nature, and the small expenditure of capital involved, were, and are, accountable for the smallness of the charge. At the Beckton works installation, this charge amounts to 0·94d. per 1000 cubic feet; and at Kensal Green, to 0·92d. These plants have been at work for upwards of three years.

Purification.—Practically one impurity alone, carbonic acid, calls for removal; and the advantage of leaving this in the gas has been sometimes considered. In face, however, of the fact that 1 per cent. of carbonic acid depreciates the illuminating power of carburetted water gas 0·7 candle, the desirability of its elimination is apparent. The cost of purification is, therefore, almost in direct proportion to the percentage of carbonic acid present in the gas; and the following figures relating to such quantities will be of interest:—

Percentage of Carbonic Acid Present in Crude Gas (Lowe Process).

—	Coke per 1000 Cubic Feet.	Illuminating Power of Gas (Purified).	Carbonic Acid.
	Pounds.	Candles.	Per Cent.
Beckton	50·0	25·00	2·05
Kensal Green	50·0	20·10	3·00
Copenhagen	44·3	21·44	3·80

There is a trace of sulphuretted hydrogen to be considered—an impurity varying in its degree with the use of different oils, and therefore one that provision must be made for; but the lime vessels that deal with the first impurity are, with a little judgment, all that is necessary to guard against the taint of the latter. Bisulphide of carbon is practically absent from the gas, as also ammonia.

Cost.—This brings the subject to the most crucial of all considerations—viz., cost. The cost of oil, the first and most important item, in common with coal, varies with localities. On the seaboard of the United Kingdom, in ports at which the tank-steamers can discharge, it is safe to say that suitable oil is obtainable, by single cargo, by contracts extending over several years, delivered into the storeage tanks of the purchasers at 2½d. per gallon. Inland, the prices will always be higher than on the coast; but, in small and intermittent quantities, the oil desired is obtainable at not more than 3d. per gallon. Bearing in mind the vast sources of the oil supply, and the fact that the main centres of the respective and contending interests are far removed from each other, there is less reason to anticipate an increase than a decrease on present prices. The protection of long contracts is available as in the case of coal. In the discharge of oil cargoes, the immunity from any possibility of labour trouble that characterizes the entire system is again derived. The storeage in large quantities of oils with a flash-point above 100° Fahr. offers no serious risk or disability.

The price of coke used, when the users are their own customers, does not affect the profit and loss sheet; but it is a delicate duty of analysis to determine the exact extent to which the enhanced value of coke, due to the co-operative production of water gas, should be credited to the ultimate economy of the process.

The costs of the remaining items will vary with localities; but the cost per 1000 cubic feet can hardly be much affected in such comparatively unimportant constituent charges. The following statements of complete manufacturing costs will be found commercially representative of the entire system.

Total Manufacturing Costs per 1000 Feet of Gas (Lowe Process).

	Beckton. *Illuminating Power, 25 Candles.*	Kensal Green. *Illuminating Power, 22·89 Candles.*
1. Coke at 10s. 6d. per ton, 50 lbs.	2·69d.	At 12s. 6d. per ton, 52 lbs. 3·49d.
2. Oil at 2·62d. per gallon, 3·87 gallons	10·16	At 2·94d. per gallon, 3·49 gallons 10·24
3. Water, 10 gallons per 1000 cubic feet	0·06	10 gallons per 1000 cubic feet 0·06
4. Labour	1·50	1·50
5. Purification	1·04	} 0·90
6. Sundry stores, gas, &c.	0·18	
7. Wear and tear	0·90	0·92
	1s. 4·53d.	1s. 5·11d.
Cost of pound of sperm	0·193d.	0·219d.

Taking the quantity of oil and coke used in the Copenhagen plant, and basing the other charges upon English workings as given, and their costs, the price of 21·44-candle power gas comes to 1s. 2·7d. per 1000 cubic feet. The itemized results from this plant have not been given, as it has temporarily ceased working, except in cases of emergency, owing to prohibitive customs duty on oil imposed by the Danish Government.

Cost of Carburetted Water Gas at the Glasgow Works.

A Fortnight's Working.

Oil used	15,966 gallons, at 2¼d.
Coke to generator and boiler	61 tons 17 cwt., at 5s.
Breeze to boiler	6 tons 8 cwt., at 1s.
Wages paid	£26 0s. 9d.

Gas made (purified) 2,828,140 cubic feet.

Cost per 1000 Cubic Feet.

Oil	12·702d.
Fuel	1·339
Wages	2·209
Purification	0·600
Total	16·850d.

Illuminating power, 32·67 candles.

The Belfast installation has been omitted, as the Engineer of that works is now preparing an exhaustive statement of its working.

Comparisons.—In comparison with the above figures, the following, in relation to the production of coal gas in London, will be of leading interest. The average cost of the production of 16·5-candle power coal gas, by the three Metropolitan Gas Companies, for the years 1890, 1891, 1892 inclusive, was 17·25d. per 1000 cubic feet; the average cost of the pound of sperm thus produced being 0·305d. In order to make an equitable comparison, this last figure must be qualified by the fact that it was calculated from the amount of gas sold, which for the term dealt with is 5·3 per cent. less than the amount made. Making this allowance, the figure becomes 0·289d. per pound of sperm. It is, of course, a matter of fact that this cost has been largely reduced at certain periods by the enhanced price of residuals and an unusually low cost of coal; but, taken over the lengthened period stated, the cost given above for coal gas should be fairly indicative of normal conditions.

Upon these figures, and their relative economy, the case of carburetted water gas rests. Dependent as its supply is here upon coal gas, it is not to be considered otherwise than as a concomitant and auxiliary to that process. But it is more than an enricher; it has pretensions to adoption other than those of mere cost—its merits as an emergency plant call for notice. From dead inactivity, with no fire in the generator, plant of any size can be brought into full use in three or four hours, and dropped in as many minutes; while the cost of keeping the plant hot for use, in which condition it is instantly available, is not appreciable. The

illuminating power of the gas can be varied to almost any desired extent in a few minutes; and this, in association with controlled volumes, gives a command of enrichment not otherwise obtainable. It is almost independent of labour. Untried and inexperienced men under competent personal supervision, could assume control of a plant in emergency. With a normal coke stock, it affords a partial independence of coal supplies; and an important exemption from the effects of strikes, irrespective of their source, is secured. By its use, the production of high candle-power gas is practicable and economical; while at the cost of production given in this paper, it is qualified to enrich much of the coal gas produced in this country and to reduce its cost at the same time.

This is the case for carburetted water gas in 1894. It has lived through the doubts and difficulties attached to its introduction into this country and to the initial stage of its existence here, and to a great extent, the author ventures to believe, the strong prejudice not unwisely extended to a new process. Its future may with safety be left to the progress of the industry which it may already claim to have assisted and strengthened.

Sale of Additional Capital by the Croydon Gas Company.—In response to the invitation which appeared in our advertisement columns a few weeks since, a good number of tenders were sent in for the 500 ordinary £10 shares which the Directors of the Croydon Gas Company announced their intention of issuing; being a portion of the additional capital authorized by their Act of 1877. The shares were all sold last Wednesday, at an average price of £22 9s. 4d. each.

London Water Companies' New Stock.—The Select Committee of the House of Commons presided over by Sir Joseph Pease had under consideration last week the subject of the form of the sinking fund clause to be inserted in the Water Companies' Bills referred to them. We are compelled to hold over our report of the proceedings; but we may mention that the Committee decided, as far as the new stock is concerned, that it is to be raised by auction at not less than 3¼, nor more than 3½ per cent., and to be redeemable at the end of 25 years.

The London Vestries and the Gas Companies.—At the meeting of the St. Luke's Vestry last Tuesday, the Clerk (Mr. G. W. Preston) read a letter from Mr. J. W. Field, the Secretary and General Manager of The Gaslight and Coke Company, notifying the intention of the Directors to reduce the price of gas 1d. per 1000 cubic feet, as mentioned in the JOURNAL last week, and stating that the charge for gas supplied to the public lamps will in future be 2s. 4d. per 1000 cubic feet. It was resolved that the other Vestries and District Boards north of the Thames should be asked to co-operate in pressing for an inquiry by Parliament into the working of the London Gas Companies. At the meeting of the Vestry of St. George's, Hanover Square, on Thursday, a petition to the House of Commons for such an inquiry was approved.

The Engineership of the City Commissioners of Sewers.—At the meeting of the Commissioners of Sewers last Tuesday, the question of appointing an Engineer, in succession to the late Mr. W. Haywood, was under consideration. A Special Committee reported in favour of Mr. D. J. Ross, who has been for upwards of twenty years in the service of the Commission, and for a large portion of this time filled the position of Chief Assistant to the Engineer. Some members were, however, of opinion that a gentleman of eminence in his profession, who would be able to meet any other engineer upon equal terms, should be appointed; and a motion was submitted to obtain the view of the Commission on the question. It was only feebly supported; and the Committee's recommendation was agreed to. Mr. Ross enters upon his new duties at an advance of £250 per annum.

Visit of the Society of Engineers to the Old Kent Road Gas-Works.—Last Tuesday, a party of members of the Society of Engineers, accompanied by the President (Mr. G. A. Goodwin), several of the Council, and the Secretary (Mr. G. A. Pryce-Cuxson), made their first vacation visit; the place selected being the Old Kent Road works of the South Metropolitan Gas Company. These works are interesting from the fact that they are the original works of the Company, which was founded sixty years ago, and incorporated in 1842. They are in two separate portions—the old and the new; but no extensions have been carried out here since the East Greenwich works were started. The productive power at the Old Kent Road is about 9 million cubic feet of gas per 24 hours, or about one-fourth of the Company's maximum daily make. The Company's Chief Engineer (Mr. F. Livesey) received the visitors, and conducted them round the works, where they had an opportunity of seeing the operation of charging and drawing retorts by West's machinery worked by compressed air, and of inspecting the experimental plant erected for the manufacture of carburetted water gas by Professor Lewes's system. Tea was served before the visitors left; and a hearty vote of thanks was accorded to Mr. Livesey for his courteous attention.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1131.)

BUSINESS on the Stock Exchange has been very quiet during the past week, as it has for several weeks. It seems as if this were becoming its fixed and normal condition; and the perturbing influence of the Epsom races was not needed in order to diminish that which was already contracted to small proportions. But, though everything was so quiet, there was just enough movement to show that the tendency was more favourable on the whole. Consols and such-like luxuries did not improve upon their recent march upward; but several of the chief departments were decidedly better, including the Foreign Market and United States rails. Home rails were rather kept down by apprehension as to a Scotch coal strike; although this does not threaten to become a formidable fact, so far as can be at present foreseen. The ever-increasing abundance of money is, as usual, producing a crop of new undertakings; and anything tolerable is taken up, if only with an eye to running it up, and then snapping a premium. Silver exchange is better. There was considerable activity in the Gas Market; and transactions in the leading issues were numerous. Gaslight "A" was very animated, especially towards the close—prices fluctuating so that it was a question whether the quotation would mark a rise or a fall; but eventually it remained unchanged. The secured issues were in brisk demand; and the "C," "D," and "E" 10 per cents. improved a couple of points. In South Metropolitans, the "B" stock monopolized attention; and though one bargain showed only a moderate price, the closing transactions were at the best figures of the week. Commercials were not dealt in. The Suburban and Provincial Companies were quieter than usual—hardly a transaction being effected during the whole week; and quotations did not vary. The Continental Companies were irregular; Union improving, while Imperial receded, and European stood still. Among the rest, Buenos Ayres were prejudicially affected by the course of Argentine affairs; but Oriental recovered. The Water Companies were more than usually quiet, but with a generally firm tendency; and New River shares and debentures improved in quotation.

The daily operations were: Gas was but moderately active on the opening day; and prices marked generally were only middling, except Continental Union, which rose 2. Business continued at about the same level on Tuesday; and the sole change was a fall of ¼ in Buenos Ayres. New River debenture gained 1. Wednesday was noticeable for the awakening activity of Gaslight "A;" though quotations remained unchanged. On Thursday also Gaslight "A" almost monopolized attention; prices being steady. Oriental rose ¼. New River advanced 2. On Friday the transactions were fewer; but the prices showed rather better figures. Imperial Continental relapsed 2, with business done. Saturday was unusually active; Gaslight "A" being much dealt in. The "C," "D," and "E" stocks were also in demand, at an advance of 2.

ELECTRIC LIGHTING MEMORANDA.

The Dangers of Electric Supply in the United States—The Niagara Electric Power Transmission Scheme—The Union of Electricity Producers and Users.

THERE are indications that the great American public are getting tired of the dangers, troubles, and annoyances that have been inflicted upon the inhabitants of the cities and towns of the United States by electricians. We, who live upon this side of the Atlantic, are well accustomed to be told how much more developed all electrical industries are in the States than they are in this slow-moving country; but at last we may comfort ourselves with the observation that the proverbial expression which connects great haste with less speed is being illustrated once more in the experience of American electricians. Time was when these enterprising gentlemen took it upon themselves to run overhead wires for lighting purposes all over the chief cities of the States, with the immediate effect of making a dazzling show of lamps, while people in this country were slowly working out the practical problem of distributing electricity without detriment to the appearance of our towns or risk to their inhabitants. A crisis came, however, and the Government of New York set the example to the authorities of other States by forcing the local electric lighting companies to put their wires underground, out of harm's way. Something very similar is about to happen to the electrical traction interest, which has sprung up like a weed in all parts of the United States. There was nobody to check the "trolley-wire" concerns from going wherever they pleased and setting up their plant according to their own devices. It is small wonder that electrical traction prospered under these conditions; but the natural reaction is setting in. It is being realized that the introduction into a town of a trolley-wire electrical tramroad constitutes a standing danger to life, as well as to property of various kinds. The American community is not particularly careful of the lives of individual citizens—being governed

by the idea that people ought to keep out of the way of being hurt by appliances of civilization; but injury to property is quite another matter. Accordingly, the National Board of Fire Underwriters, having discovered within the last three months that fires caused by electricity have become "alarmingly frequent," have decided upon a policy of extensive re-inspections of insured premises, with the result that many of the common practices of the electricians are being condemned.

The electrical transmission of power has not hitherto made much headway; but it has been understood that great things are to follow the starting of the Niagara power scheme. Not only are towns, illuminated and supplied with power for all purposes by this agency, to spring up round the site of the Niagara Company's central establishment, but every town situate within 200 miles of the spot was to be served in the same way, at a saving upon the expense of working steam-engines of the most economical type. It has been shown, however, by some electrical experts who are presumably not interested in the Niagara power scheme, that it is doubtful whether electric transmission from the Niagara Falls beyond a 30-mile radius can be made to pay at present, even if it may be assumed that there will be no engineering difficulties to overcome. It is clear that, if the commercial future of a scheme for the electrical utilization and distribution of the power of Niagara is doubtful, there can be no prospect at all for the long-distance electrical transmission of power generated in the first place by means of steam-engines.

It is reported that an organization has been formed and started in life under the style and title of the Electricity Users' Association, Limited, the objects of which, although supposed to be explained in a two-column article in a recent number of the *Electrical Review*, are not so clear to our mind as we could wish. The Association is under the presidency of Mr. D'Alton, of the London Electric Supply Corporation, who is assisted by a Council largely composed of managers of electrical supply stations. The idea is that the Association is "to represent both the interests of those running electric light stations, and of the consumers supplied by them." This is called by our contemporary "a policy which, on the face of things, gives it a very high standing;" but it is difficult to make out in what the "policy" consists. The Association "practically resolves itself into a body desirous of performing the functions of a consulting engineer"—which is just what a good many other companies and individuals are equally anxious to do. The part of the users of electricity in this combination appears to be limited to the privilege of subscribing a guinea a year to have their wires, &c., looked after, and be advised generally as to spending money upon these matters. Our contemporary is fain to admit that the question might be raised of whether, on this account, the title of the Association is not a misnomer; but comfort is found in the reflection that, so far as the name of the concern goes, it is merely modelled on that of similar associations dealing with steam-power plant. Among other offices that Mr. D'Alton and his colleagues kindly offer to perform for users of electricity, is that of inspecting central station lighting undertakings for municipalities which have no resident electrical inspector of their own. Upon this head, our contemporary remarks that "it is not every corporation which can afford to equip a laboratory and appoint a man of suitable attainments and standing to discharge the duties of such an office." But, on the other hand, there is no particular reason why such municipalities should go to Mr. D'Alton's Company for help in such a matter, instead of occasionally calling in an expert of their own selection. It may be true, as hinted, that an Association having a governing body composed of engineers and managers of central lighting stations must possess all the knowledge there is about practical electric supply; but these gentlemen cannot go about the country acting as consultants for everybody who happens to want them. They must employ others to act for them in such matters; and these people may be no better, if they are no worse, than the electricians who are already open to engagements of the kind. On the whole, therefore, we do not think much of the prospects of the Electricity Users' Association, so far as the public are concerned. How far any organization of the kind may be competent to protect or to represent the interests of "those in whose hands the actual running of central stations lies," we have no means of knowing. But it is hard to agree with the propriety of naming a trade society after the customers of the traders. It appears to us, however, that what working the electricians—for whom, as a class, we have great respect—really need is not another association, even if maintained by means of other people's guineas, but more work in their own sphere of utility. But the profession is sadly overmanned; and the number of unwilling "inspectors" bears to that of active workers an uncomfortably high proportion.

Mr. J. Chew, the Manager of the Blackpool Corporation Gas-Works, who has hitherto received a commission in addition to his salary, is in future to be paid a fixed sum per annum, which will be an advance on his present remuneration.

Mr. John Wyld, who has for many years had charge of the chemical works of the Bradford Corporation, has resigned that position, on his appointment as Manager of the ammonia works at Birmingham belonging to Messrs Brotherton and Co.

EIGHT HOURS FOR WORK.

An interesting addition to the literature of the "eight hours" controversy has just appeared in the form of a book by Mr. John Rae, bearing the title given above, which may now be obtained at the libraries, and deserves to be read by all who are concerned with the working out of this question of the day. Mr. Rae's book is published by Messrs. Macmillan and Co.; and in this notice of it we do not propose to review it in the strict meaning of the term, but to refer to such portions of its contents as appear to bear specially upon those sides of the eight-hour question of which we have already taken cognizance. In all present and future discussions of this subject, it is evident that the starting-point must be the Mather experiment, considered in the Journal for April 3 last, which has since then been debated and criticized from all points of view in all sorts and descriptions of newspapers, magazines, and technical journals. Mr. Mather would probably not have been pleased if his report upon last year's working of his Salford establishment under the new experimental conditions had satisfied everybody. He is therefore to be congratulated on the liveliness of the controversy that has sprung up upon this publication.

In our own notice of the report, it was observed that the New Unionists would not like it; and we were also prepared to learn that many employers of labour in Mr. Mather's industry did not believe in it. The dissatisfaction of the New Unionists might naturally be expected to spring from the discovery that the output of a manufacturing establishment working only 48 hours per week was not materially diminished thereby, and that no more hands were needed to do the same amount of work in the shortened week; thereby removing the ground from under their cherished assumption that the general adoption of the eight-hour day would absorb a proportion of the unemployed. It was the same discovery that many of Mr. Mather's compeers in business have declined to believe in. Granting that the fact was as stated, it was argued on the part of the dissentient employers that such a result could only have been attained under exceptional conditions. It was alleged that the working staff of the Salford Iron-Works were last year upon their best behaviour; being under the orders of their Union leaders to make the experiment appear to answer for the time. Ridicule was plentifully poured upon the corollary naturally following from the presumed source of Mr. Mather's success, that the output of a self-acting machine would be as much for eight hours as it had previously been for nine. Even supposing, it was argued, that men engaged in manual labour can do as much work in eight hours as they had been accustomed to do in nine, it is absurd to claim that the automatic machines which do so large a share of the work of our factories are susceptible to the same influence, and capable of exhibiting the same effects. Finally, of course, Mr. Mather's personal good faith in instituting his experiment and promulgating his declared results was disputed.

So far as Mr. Mather is concerned, his answer to his critics, which duly appeared in the form of a letter in *The Times* on the 31st ult., must be left to speak for itself. His conclusion is that, "as the question stands at present, the 48-hour week holds the field as the best arrangement of working time, and as affording the best conditions for the production of the best work, to secure the best interests of the engineering and machine-making industry of the country." He goes on to make the obvious point that, "until other employers, or at least one of them, dispose of my conclusions by a thorough, fair, and lengthened trial, equal in value to those made by Mr. Allan, M.P., and others, and later by my firm, it is futile to meet our indisputable facts by mere figures of speech and prophecies of imaginary calamities." He declares that his own earnest desire in this matter is "to direct the attention of workpeople and employers alike from legislative action to mutual and voluntary effort." Naturally, this idea does not please the demagogues who have jumped into Parliament from the Eight-Hour Day platform.

So much for Mr. Mather. Mr. John Rae treats the subject generally, with the professed object of determining what would be the probable consequences of the adoption in this country of an eight-hour working day. He starts with the prudent resolve not to trust to speculations built on the available stock of assumptions about the natural effect of shorter hours, which nobody cared to verify; and he decided to ascertain instead, if possible, what their actual effects have been in the countries which have had experience of them, "to learn how the ten-hour day, and the nine-hour day, and especially the eight-hour day itself, have worked out where they have been in actual operation." He makes no reservation in giving the result of his inquiries. "In the course of the investigation," he says, "I have found it impossible, personally, not to grow a stronger and stronger believer in the eight-hour day. Shorter work-hours have left every nation that has chosen them at once healthier, wealthier, and wiser; and the shortening to eight seems, if I may say so, to be blessed above its predecessors." The principal reason for the latter conclusion is, of course, the abolition of the ante-breakfast start.

Mr. Rae's history of the eight-hour day in England will surprise many of his readers. It is popularly supposed that short hours of work are essentially a modern conception; but

the truth of the matter is that a hundred years ago, and farther back than that, it was the exception for men of any trade, or labourers, to work longer than eight hours a day. The change came with the introduction of the factory system. "Those who laid down expensive machinery grudged seeing it stand a moment idle, and they lengthened the period of work first to twelve hours, as it was in Arkwright's time, and then to thirteen, fourteen, and sometimes sixteen hours a day. They grudged even to pause for a meal. In Manchester, at the time of the Reform Bill, the mills ran from five in the morning till nine at night without any stoppage but an hour for dinner; and the hands had to breakfast as best they could while standing and attending the machinery." It is unnecessary to tell how this state of things has been corrected, until the only question is not whether working hours ought to be lessened, but how much they can be diminished with safety to all the interests concerned. Mill owners perceive that their predecessors were wrong in this regard; and although much fright is still expressed about the competition of the pauper and long-hour labour of other countries, "we are coming more and more to perceive that Mr. Mundella is probably right in saying it is really their long hours that save us from their competition, because those long hours impair the personal efficiency of their labour, and the competition between the nations is growing every day more and more to be mainly a competition in personal efficiency." Mr. Rae works out this point in great detail in a valuable chapter entitled "The Eight-Hour Day at Work," which is practically a summary of facts bearing upon the subject.

Here we encounter the first mention of labour in the gas industry. Mr. Rae has learnt that eight-hour shifts are now in force in many gas-works, and have been characteristic of some establishments of the kind for a long time. This writer seems to understand that an eight-hour shift in a continuous industry is a very different thing from an eight-hour working day. He recognizes also that the question of cost does not govern the choice between the two methods of dividing the gas-works day, inasmuch as the labour charges are borne by the selling price. He admits that experience of the different shifts in gas-works has been "curiously diverse." He knows, moreover, that the twelve-hour shift does not mean twelve hours work. Upon this head he remarks: "In gas stoking on the twelve-hour system, the men usually work an hour and rest an hour alternately, or in some places work an hour and rest fifty minutes, so that six or seven hours of effective work is all that is ever performed. Shortening the hours to eight means mainly shortening these alternate intervals of rest." The story that was told by the gas managers and stokers called as witnesses before the Labour Commission is fairly well summarized by Mr. Rae, who perceives that the success of the eight-hour shift in London gas-works was jeopardized by the circumstances amid which it was introduced.

One of the matters to which Mr. Rae has devoted particular attention is that of the so-called "Reserves of Personal Efficiency" which exist in working people, and, according to such experiences as those of Mr. Mather, can be drawn upon so as to make up for shorter working hours. It is claimed that even when the improvement obtained under shorter hours is not due to working harder, it can be traced to working better and more accurately. He grapples with what he calls the "common mistake" that it is impossible for any improvement in personal efficiency to tell on the product of self-acting machinery, which is at the bottom of much of the opposition of employers to the idea of shortening working time. It is admitted that nothing seems clearer, before the facts are looked into, than that such an effect is impossible; "but nothing is better established by the facts than that it is done every day." The first false impressions on this subject, in which so many remain, come, says Mr. Rae, from failure to observe two things: "First, with most automatic machinery in common use, there is always plenty of room for the ability and push of the workman to tell decisively on the result; and second, the short-hour workman is a being of more push and ability than the long-hour workman."

This is the whole case, in a nutshell. It is obvious that such a conclusion is fatal to the cause of the Socialistic Trade Unionists, whose confessed object in procuring the shortening of the hours of daily labour to eight is to make more work—that is, to diminish production. If the output is to remain the same, there can be no valid reason for keeping factories and workshops open for 54 hours rather than for 48 hours a week. Mr. Mather, Mr. Allan, Mr. Johnson, and others, declare that the output is not diminished by the adoption of the 48-hour week, even with self-acting machinery and piecework. Then upon this evidence we are justified in regarding as frustrated the Trade Unionist purpose in favouring the eight-hour day. The Socialists who have captured the movement advocated it not so much for the sake of the men who might be actually working, still less on behalf of the industries in which they might be employed; but wholly because of the effect which they imagined it would have upon the unemployed. It is part of the irony of Fate that now, when the movement appears to be making headway in the country, its strongest advocates are able to claim for it that it is actually beneficial to the men employed, and to the industries in which they are engaged. The cause of the unemployed remains where it was—a commonplace of demogoguery, suitable only as padding for orators who "tickle the ears of the groundlings" at mass meetings.

Mr. Rae's general conclusion is that "the shortest-houred people are the best workers;" but he admits that this experiment of shortening hours cannot be repeated indefinitely. In reply to the familiar *reductio ad absurdum* of the query whether eight hours is to be further reduced to six, and from six to four, he says: "Stop when the day is shortened just not too far for the resulting increment of energy to make up for the loss of time." This is a point that can only be ascertained by experimentally feeling the way to it; but, so far as the eight-hour movement is concerned, Mr. Rae holds that "it has been proved by a far greater number of practical experiments than ever before preceded any general reduction of hours," that the limit is not exceeded in this instance. Mr. Rae cites the experience of the Colony of Victoria as showing that the eight-hour day there established has cost little or nothing. "Look for the effects of it where you will, they still ever elude your observation. Wages have not fallen, wages have not risen; production has not fallen except in certain trifling cases, prices have not risen except again in certain trifling instances; trade has not suffered, profits have not dwindled (or we should have heard croaking); the unemployed have not vanished, not so much as shrunk in any perceptible degree; the working classes—the great body of the nation—have an hour more to call their own, that is all." Theoretically, and obviously, there must be a limit in the division of the day between work and rest at which the maximum of efficiency is reached. This will probably differ for different nations and individuals, as it certainly does for various occupations; but Mr. Rae is confident that Victorian experience will bear him out in the contention that, for the English race, the handicraftsman's limit will be found generally rather below than above the eight hours a day.

A Correction.—Mr. S. Glover, of St. Helens, writes to call attention to the accidental omission of a decimal point, before the figures in the third line from the bottom of the second column of p. 1060 of the last issue of the JOURNAL. The quantity of ash in the fuel referred to by him was ·33 (not 33) per cent.; the figures as printed, without the point, representing an obviously disproportionate bulk of ash.

Institution of Civil Engineers.—In addition to the Telford Premium awarded by the Council of the above Institution to Mr. Charles Hunt, for his paper on "The Construction of Gas-Works," as intimated in the JOURNAL last week, we find, from the official list of awards since issued, that similar premiums were bestowed upon Professor Boverton Redwood and Mr. Henry Ewart, for their papers on "The Transport of Petroleum in Bulk," and "The Maligakanda Service Reservoir, Colombo." Mr. W. J. Bird Clerke, B.A., C.I.E., has received a Telford Medal and a Telford Premium for his paper on "The Tansa Works for the Water Supply of Bombay;" Professor Franz Kreuter, of Munich, being the recipient of a similar award for his paper on "The Design of Masonry Dams." With one exception, these papers have been noticed in the JOURNAL.

German Association of Gas and Water Engineers.—Further particulars of the annual meeting, already announced in the JOURNAL (*ante*, p. 657) of this Association are now to hand. The following are among the more important papers to be read on the occasion: "The Effects of Temperature on Gas in the Holder," by Dr. W. Leybold; "On Carburetting," by Dr. E. Schilling; "Gasholders," by Professor Pfeifer; "On the Behaviour of Nitrogen in the Distillation of Coal," by Dr. Knublauch; "Lighting with Uncarburetted Water Gas," by Dr. Strache; and "The Water Supply of American Towns," by Herr A. von Ihering. The reports of the Commissions on "Photometry," "Heating by Gas," and "Gas-Meters" will be presented; and Dr. H. Bunte and Herr W. von Oechelhaeuser will lay before the meeting information on the gas industry in the United States, gleaned during a trip thither. The programme issued by the local Committee of Carlsruhe shows that excellent arrangements have been made for the comfort and recreation of those attending the function, which, as previously mentioned, is fixed for the 19th to the 22nd inst.

Death of Mr. T. Eccleston Gibb.—The death is announced of Mr. Thomas Eccleston Gibb, the Vestry Clerk of St. Pancras, whose name has occasionally appeared in our columns in connection with the electric light scheme which he initiated and was largely instrumental in carrying out in that parish. Deceased was formerly joint Editor of the *Liverpool Mercury*, in which he held a proprietary interest. He was appointed in 1869 to the office which he held at the time of his death; and he earned a high reputation as an expert in the complexities of local government. He was elected Member of Parliament for the Eastern Division of St. Pancras at the General Election of 1885; but he lost his seat in the following year, and failed to regain it in 1892. He was an Alderman in the first County Council for London in 1889; but he was not re-elected by the present body. A few years ago, Mr. Gibb had to take a voyage to South America to recruit his strength after a severe illness; and this journey seemed to completely restore him to health. But an apoplectic seizure occurred a few months since, followed shortly afterwards by a second; and to these he succumbed last Wednesday, in his 56th year.

NOTES.

A Novelty in Power Transmission.

It is worth placing upon record that, at the recent *conversazione* of the Royal Society (briefly noticed in the JOURNAL for the 8th ult.), Mr. Killingworth Hedges exhibited a model of his system of transmitting power by the agency of spheres or balls. This is a distinctly novel method of transmitting motor energy; and it is interesting as illustrating the principle upon which power is conveyed from particle to particle of incompressible matter. Instead of water, as in a hydraulic power system, Mr. Hedges uses steel balls, each one having a minimum strength to resist crushing of 15 tons; and these are packed closely against one another in a pipe. Any pressure applied to the first of the series is immediately transmitted through the whole to the last, and from this to whatever it may then happen to bear against; the tube containing the balls running round corners and going up and down just like a hydraulic power pipe. Of course, at the bends the tube containing the row of balls has to be made with care; and it must always be very smooth inside. So far, experiments with this system of power transmission have been carried on up to a distance of 150 feet, over which, Mr. Hedges states, the friction was inconsiderable. For some applications, the method has peculiar advantages, since there is nothing to leak out or freeze.

A Combination Gasholder and Purifier.

A curious arrangement of a combined gasholder and purifier has been introduced by Mr. M'Donald, the Engineer of the Kentucky Heating Company. In a statement communicated to *Light, Heat, and Power*, Mr. M'Donald says there is nothing new about the gasholder portion of this combination, with the exception that the holder is made 6 feet deeper than its tank; and in the space thus gained the purifier is built. This purifier is a box with a gas-tight floor and sides, and is in all respects precisely similar to any other purifying-box, with the difference of being situated inside the holder. The inlet-pipe delivers the gas under the first tier of sieves, and the gas finds its way through the purifying material and out by the outlet-pipe; the holder meanwhile rising and falling according to the demand and supply of gas. A pair of the holder-purifiers are placed side by side, connected together as is customary for purifiers. When it is necessary to change the purifying material, the holders are thrown out of use, and are entered by men with wheelbarrows through doors in their sides. It is difficult to understand what is the object of this combination; but Mr. M'Donald claims that the arrangement is very economical, both of space and of money, and that the gas is satisfactorily purified. He remarks, however, that the business of furnishing fuel gas in connection with a natural gas supply differs very materially from that of supplying illuminating gas. He is able to completely shut down his gas-manufacturing plant every night, as well as every warm day—the demand in the meantime being supplied by the natural gas; so that a delay in emptying or refilling one of his holder-purifiers would not cause any serious inconvenience. It is further remarked that the quantity of fuel gas consumed on a cold day is so great that it would be very expensive to provide holder room for it. Moreover, this gas has to be supplied at a higher pressure than illuminating gas. All these reasons, it may be remarked, fail to show why it should be desirable to put a purifier inside a gasholder, in preference to keeping separate the two processes of gas purification and storeage.

Ice from Natural Gas.

It is probable that, before the natural gas supply of certain parts of the United States is exhausted, this gift of Nature will be better utilized than has hitherto been the case. Indeed, it would not be surprising if the advantages of the natural gas supply were only to become fully appreciated just before it ceases for ever. It appears, from a recent contribution to an Indianapolis newspaper, that a local firm have constructed a refrigerator for making ice by means of the cold produced by the expansion of natural gas to atmospheric pressure. This is the principle of all artificial-ice machines; yet it seems to have only just occurred to some American engineers that natural gas as it issues from the wells at pressures amounting in some instances to 20 atmospheres, and at a temperature of 42° Fahr., presents the sole physical condition necessary for the production of cold by gaseous expansion. Assuming the density of the gas to be only half that of the surrounding air, 1000 cubic feet of it will weigh 38·5 lbs. According to Peclet's formula, by expanding a gas from a pressure of 20 atmospheres to that of one atmosphere; its temperature would be reduced 318° Fahr. below freezing; and by expanding 1000 cubic feet of gas per minute, there would be a cooling effect of 318° × 38·5 lbs., which would make 72 lbs of ice per minute from water at 62° Fahr. Hence a very ordinary gas well, supplying 1½ million cubic feet per diem, is theoretically capable of producing 51 tons of ice daily at a cost of not more than 50 c. per ton; and, after all, if delivered in its expanded state to furnaces, &c., the gas would produce, on burning, as much heat as if it were delivered for fuel direct from the well. Hence, by proper management, the natural gas supply of Indiana and Ohio should supply all the ice wanted by these States during the hot season as it actually furnishes most of the heat required all the year round.

COMMUNICATED ARTICLE.

THE DEVELOPMENT OF THE GASHOLDER.

By A. M'I. Cleland.

CONCLUDING ARTICLE.

As previously stated, those who took part in the controversy carried on during the year 1887, having reference to the guide-framing of gasholders, advocated either its total abolition, or that it should rise only 6 feet above the tank curb, or else reach to the height of the outer lift in a double holder, or to the second lift in a triple holder. The advocates of total abolishment received the least support; their greatest difficulty being to prevent the holder tilting. Writing in 1887, Mr. G. Livesey said: "If some *practicable* means could be devised whereby all the bottom rollers might be made to rise or fall equally, and none of them could either rise above or fall below the others, the holder would then, to all intents and purposes, have a solid foundation, and no columns or guide-framing of any kind would be necessary. . . . As, however, there are no known means for keeping the bottom rollers in the same level plane, we must until a better way has been shown, prevent tilting by means of tiers of rollers placed a certain vertical distance apart on the sides working against guide-framing." And farther on in the same letter he said: "The utmost I can see is, for a double holder, guide-framing not less than than one lift high; and for a three or four-lift holder, guide-framing not less than two-lifts high; and I much doubt whether anyone will attempt to go beyond this." Such an expression of opinion from so eminent an authority was bound to carry great weight. And yet, by Jan. 11, 1894, a triple-lift holder, with a diameter of 115 feet, a total height of 72 feet, and a capacity of 700,000 cubic feet, was working satisfactorily at the Widnes Corporation Gas-Works; alternately rising and falling without a single foot of guide-framing above the tank curb. The "practicable means" had been devised by which a holder could be guided from the base, and yet kept perfectly level—the history of which forms a most interesting episode in the development of gasholders.

Among the controversialists who took part in the discussion carried on in the JOURNAL OF GAS LIGHTING during the latter half of 1887, none evinced greater interest in the subject than Mr. William Gadd, of Manchester, who, in an article published on 16th of August, suggested a scheme which practically amounted to "turning the guide-framing upside down, and burying it, so to speak - leaving the holder in its present position." This proposal was severely condemned; and nothing further was heard of it. But by the 6th of October, Mr. Gadd continuing his investigations of the subject, had devised and patented,* in conjunction with his colleague, Mr. W. F. Mason, a very ingenious and simple invention, by which all the above-ground framing could be abolished, and the holder guided from the base by means of spiral guides affixed to the sides of the tank or the holder. The guides were to be placed at any angle from 45 to 60 degrees; and as the rollers, which were to be radial, tangential, or angular, worked in the guides, they imparted a helical or screw-like motion to the holder as it rose or fell in the tank. When introducing this method of guiding holders to the notice of the gas world, through the medium of the Manchester District Institution of Gas Engineers, in August, 1888, Mr. Thomas Newbigging said: "So long as the rollers are free to move within the guides, it is impossible that the holder can tilt so as to get out of the vertical; the tendency of wind or other pressure exerted against the sides or on the roof of the vessel being to produce what may be described (imperfectly, however) as a locking action, which will sustain the holder in the upright position, however great the strain within the resisting strength of the rollers and their carriages. Whilst this locking or gripping action gives rigidity to the vessel, enabling it to resist the overturning force, the rollers are perfectly free to rise and descend within the guides."

The first practical outcome of this innovation upon all that had gone before was the erection and successful operation of a two-lift holder at the works of the Northwich Gas Company in January, 1890. This holder has a diameter of 60 feet and a total height of 40 feet, with a capacity of 109,000 cubic feet. The example set by Northwich was quickly followed by other towns; and holders on the "Gadd and Mason" system have been erected, among other places, at Wakefield, Chester, and Normanton, besides others on the Continent and in the Colonies—the largest and most recent being, as stated before, the 700,000 cubic feet holder as the Widnes Corporation Gas-Works. But Mr. Gadd's ingenuity went much farther; and by the next year he had devised and patented† several modifications of his original plan for guiding holders from the base; among them being various arrangements of torsional or tensional gearing in the shape of vertical racks, guides. or spur-wheels, or chains, bands, ropes, or pulleys, arranged in such a manner that the different wheels, ropes, or pulleys would all work together, and the holder rise or fall at all points equally.

As was to be expected, this new field of invention in connection with gasholders was quickly traversed by others; among the earliest being Mr. Ashmore, who patented‡ an arrangement of "gripping" guide-rollers, attached to the bottom curb of the

* Patent No. 13,521 of 1887. † Patent No. 18,119 of 1888.
‡ Patent No. 11,790 of 1888.

outer holder. Then came Mr. G. Livesey's arrangements of zig-zag vertical guides.* the effect of which would be to impart a to-and-fro motion to the holder as it rose and fell. Next in order we have the wire-rope system of guiding gasholders, patented† by Mr. E. Lloyd Pease, which, perhaps, cannot be too highly commended for simplicity and ease of application, as it can be adapted to existing holders, when it is desired to increase their capacities, with but little structural alteration to the existing guide-framing or tank. Unfortunately, lengthy litigation prevented for some time any great development of the wire-rope system; but as this was terminated by friendly arrangement last July, we may look forward to a rapid increase in the number of works where the holders are so guided. The last devise but one is Mr. G. Livesey's arrangement‡ for guiding the inner lifts of exceedingly shallow holders; and, finally, the list is closed, for the present, by a German inventor—Herr Otto Intze—with a further modification of wire-rope guiding.§

The name of the last mentioned inventor is more widely known on the Continent than in England, chiefly, so far as gasholders are concerned, on account of the system of overhead tank construction inaugurated by him in Germany in 1883. Overhead metal tanks, to the sides of which the guide-framing is attached, have never found favour with English engineers. though the original inventor of this manner of building tanks was an Englishman (Mr. Frederick Gye, of the Italian Opera, Covent Garden) who in 1861 took out letters patent‖ with this object in view. Nothing further was heard of overground tanks until 1885, when Professor Intze appeared before The Gas Institute, and called attention to his "Water-Tank and Storm-Proof Guide and Bell Constructions for Gasholders." Another interval of silence followed, when overhead tanks and guide-framing were again brought to the notice of the gas world by the late Mr. W. T. Walker in 1890.¶ But British prejudice was too inert, and not to be moved; and it is doubtful if a tank and framing of this description has ever been erected within the limits of the United Kingdom. On the Continent, however, Herr Intze's system has been largely adopted—as many as 49 tanks and holders being erected to his designs between the years 1883 and 1890; one gasholder reaching the respectable capacity of 1½ million cubic feet.

The history of the development of the gasholder has now been traced from its earliest inception to the present day. In conclusion, the writer desires to explain that he has dealt with the subject exclusively from an English point of view, and for one or two reasons. In the first place, gasholder building has not attained the high pitch of perfection anywhere out of the British Isles, to which the efforts of the leading English and Scotch makers have brought it. In the second place, the finest holders on the Continent, and most of those in the Colonies, have been made by, and erected with, material and labour supplied by Great Britain. Lastly, with regard to American practice especially, though the States possess some very fine examples, as a rule the gasholders erected there up to the present time are far behind our own, both in point of size and elegance of design. So that one may, perhaps, be pardoned for considering that a review of the progress of gasholder development in England is, in effect, a review of its progress in other countries. He would be a bold man who should say that finality in gasholder construction has now been reached. It is impossible to predict what direction future development will follow. Whether holders of 12 million or 24 million cubic feet capacity will be seen in every large town; whether some type of high-pressure holder will come into vogue; or whether improvements in manufacture will enable gas to be made, purified, and delivered at such a rapid rate that only a small "balancing" holder will be required for even the largest works—are questions which time alone can answer. This much at least may be taken as certain—that the interest aroused during the last seven or eight years in gasholder construction is still keen enough to warrant a belief, among those who are studying the matter theoretically and practically, that the development of the gasholder is far from having reached its maximum.

Note.—In the first of this series of articles (*ante*, p. 568), the writer stated that he had been unable to ascertain who had invented the telescope holder. Since then he has found that Stephenson Hutchison included a claim for this invention in the "omnibus" specification of his patent No. 6486 of 1833. Hutchison seems to have desired to comprise in his specification every portion of gas apparatus, as he makes no less than eight claims—comprehending "improved" retort-settings, condensers, purifiers, gasholders, index recorders and dials, and burners, Eight years later, he filed a distinct disclaimer to each claim, two of which he said had been superseded by prior inventors; four rendered unnecessary by later improvements; and one had no commercial value. The disclaimer dealing with the hydraulic cup, or telescope "gasometer," simply alters the wording of the original specification. so as to make the description more clear and concise; but one may be justly excused, in view of all the circumstances, for doubting if Hutchison was the real and true inventor of the telescopic holder.

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* Patent No. 13,057 of 1888.
† Patents No. 18,272 of 1888, No. 7616 of 1890, and No. 9131 of 1892.
‡ Patent No. 6269 of 1890. § Patent No. 14,640 of 1891.
‖ Patent No. 2075. ¶ Patent No. 4027.

TECHNICAL RECORD.

POWER DISTRIBUTION BY ELECTRICITY, WATER, AND GAS.

The above was the title of a paper read by Mr. Ed. C. de Segundo, Assoc.M.Inst.C.E., at the meeting of the Society of Engineers on Monday of last week; and the following are the portions which are specially interesting to our readers.

Briefly stated, the paper was devoted to the consideration of: (1) The efficiency of electric generating plant in central stations at the present day. (2) The efficiency of power-producing plant in hydraulic power stations. (3) The efficiency of gas-engines for the production of power. As the motors dealt with were all heat machines, the author based his comparisons on the ratio of the thermal equivalent of useful work available for commercial purposes to the calorific value of the fuel burnt per hour; and he pointed out that such considerations as cost of fuel could easily be applied after. Having given his reasons for adopting this basis for comparison, Mr. Segundo proceeded—

A steam-engine is usually accounted an extremely wasteful heat machine; but this is, strictly speaking, not the case. The only way to increase the efficiency of the steam-engine is by lowering the lower limit of temperature; but directly efforts are made in this direction, a limit is soon reached beyond which further lowering of the temperature not only ceases to be productive of any good, but is productive of evil. In short, it may be said that all the heat developed in the combustion of fuel is utilized by the steam-engine, either in doing work or in providing the means of doing work, or controlling the rate at which work is done. The efficiency of the steam-engine and boiler combined is not difficult to determine; it is the ratio of the thermal value of the brake horse power hour to the calorific value of the fuel consumed per brake horse power hour.

The efficiency of the gas-engine and its equivalent of steam-boiler requires some investigation. A ton of coal, according to Mr. Emerson Dowson, may be taken to produce 9500 cubic feet of gas and 1500 lbs. of coke, of which about 400 lbs. will be consumed under the retort. Assuming that coal having a calorific value of 14,000 thermal units per pound is used, and taking the calorific value of coke at 10,000 thermal units, the number of thermal units liberated from 1 ton of coal is (neglecting the heat necessary to raise the mass of coal to the temperature of the retort), $2240 \times 14{,}000 - 1500 \times 10{,}000$, or 16,360,000 thermal units. Of the heat developed by the consumption of the coke under the retort, a large proportion can never be expected to reappear in the gas. But 16,360,000 thermal units have actually disappeared in producing 9500 cubic feet of gas; hence, $\frac{16{,}360{,}000}{9500}$ or 1722 thermal units should be accounted for per cubic foot of gas.

Professor Kennedy, Professor Unwin, and others have made calculations as to the calorific value of a cubic foot of gas, the results of which agree fairly. The average calorific value of London gas may be taken as 620 thermal units per cubic foot at 55° Fahr., and at a pressure of 14·7 lbs. per square inch; hence the efficiency of the gas-generator (one might call it) is $\frac{620}{1722}$ = about 35 per cent.

The function of a steam-boiler is, in the case of the gas-engine, split up into two; one portion is done at the gas-works, and the remainder in the cylinder of the engine itself. Now about 24 per cent. of the heat given to a gas-engine is turned into indicated power, or in the case of a large-sized engine about 20 per cent. is converted into brake horse power. Hence the real efficiency of the gas-engine and boiler, so to speak, is about 7 per cent The efficiency of a non-condensing steam-engine, consuming 2 lbs. of coal of a calorific value of 14,500 thermal units, and working at 80 per cent. mechanical efficiency, is 8·72 per cent.; so that the total efficiency of one machine is very much the same as that of the other on this basis of argument. But Mr. Dowson claims to produce one brake horse power hour for 1 lb. of anthracite, by using his generator gas. This (taking the calorific value of anthracite at 16,000 thermal units per pound) would correspond to a total efficiency of nearly 20 per cent.—an efficiency which the steam engine and boiler can never hope to reach.

Although the author desires to consider the two heat machines on the basis of what may be termed the useful efficiency—viz., the ratio of available power or brake power to power equivalent of fuel burnt, still, in the face of so great a difference as the foregoing, it may be of interest to inquire into the reason of the difference. To do this, it is necessary to consider another efficiency—viz., the ratio of heat turned into work in the cylinder to the maximum theoretically possible. This latter quantity is expressed by Carnot's law as the ratio of the difference of temperature at which heat is received and rejected to the absolute temperature at which the heat is received. In the case of the steam-engine, this ratio is not difficult to determine, because the heat is all received at one temperature and rejected at one temperature. But in the case of the gas-engine, this is not so. As mentioned before, part of the function of the boiler, or part of the operation of calling into existence the working fluid whereby heat energy may be transformed into mechanical energy, is performed in the cylinder of the engine

itself. This operation cannot be instantaneous, in obedience to physical laws; and therefore the heat is received during an appreciable interval of time, and at temperatures varying from the temperature of the mixture at the end of compression to the maximum temperature reached by the charge after explosion. In some parts of the cylinder, this temperature may, according to Mr. Clerk, be as high as 3400° Fahr. It would appear, however, that most authorities agree upon 2700° Fahr. as about the maximum temperature reached by the charge in gas-engines of all forms. The temperature of the discharged products is not far short of 800° Fahr., though, of course, the heat rejected is not rejected at one temperature. Hence the maximum efficiency attainable should be $\frac{2700-800}{3160} = \frac{1900}{3160} = 60$ per cent.

The efficiency of the non-condensing steam-engine cylinder under an admission pressure of 130 lbs. per square inch and an exhaust pressure of 20 lbs. per square inch, would be about 18 per cent. Therefore if this steam-engine turns 8 per cent. of the heat into work, it is doing as well relatively to its peculiar limitations as the gas-engine that turns 26 per cent. of the total heat received into work. The greater useful efficiency of the gas-engine therefore must be ascribed to the nature of the vehicle used for carring the heat, and not to the superiority of the gas-engine as a heat machine.

The great faults of a gas-engine are: (1) The enormous heat lost in the cooling effects of the cylinder jackets (sometimes over 50 per cent. of the total heat; and (2) the high temperature of the exhaust products. It is not within the scope of this paper to even suggest any direction in which the efficiency of the gas-engine might be enhanced; but it is obvious that, if the link could be forged between the now disconnected heat chain in the gas-engine cycle, whereby the heat carried away in keeping down the temperature of the cylinder could be usefully expended in some other part of the cycle, the time would not be far distant that Sir Frederick Bramwell has spoken of, when all that remains of the steam-engine would be a working model or two in some obscure museum.

Attention was next directed to electric generating plant using steam power; and the author gave some practical examples of efficiencies of such plant. Discussing next the distribution of power by high-pressure water, he expressed the opinion that for working lifts, cranes, or presses, it was doubtful whether any simpler and better means could be provided in a city like London than water pressure. If, on the other hand, the form in which the power was delivered had to be changed before it could be applied, it was quite possible, he said, that the efficiency of transformation might be so low as to dissipate the economy attained in generation and distribution; and in this connection, Mr. Segundo compared the number of transformations necessary to enable a lift to be worked and an incandescent lamp to be lighted from a central power house. Reference was also made to M. Van Rysselbergh's system of hydraulic distribution in generating electrical energy, which, the author said, should enable electrical energy to be sold at considerably cheaper rates than at present. Without dealing with this scheme in detail, he remarked that it was evident the only directions in which the efficiency of the system as a whole could be increased were: (1) By decreasing the number of transformations of energy; and (2) by increasing the efficiency of either or all of these.

Considering next how power produced by gas-engines could meet the needs in electric light in a large town provided with a complete network of gas-mains, the author said: In this case (which is practically the case of every large town in the civilized world) the electric light comes as a competitor against the method of illumination which has practically only just established a firm reputation for reliability, economy, efficiency, &c. There is no doubt that the conveniences of gas for lighting and heating are apt to be overlooked because of our familiarity with them. Had we experienced the inconveniences of oil and candle lighting only, I feel sure the electric light would not have made so much progress as it has done. Further, the gas business is in the hands of a powerful body, powerful alike in experience and in resource.

Experience of practical working in London and other large towns shows that, in certain districts and under certain conditions, there is a sufficient demand for the electric light to make it worth while to work independently of the gas company altogether. But consider the very vast majority of country towns already supplied with gas, where it is obvious that an independent electric light company would eke out a very miserable existence, and that probably for only a short time, it would certainly seem reasonable that a combination of electric light and gas interests would solve the problem of electric supply to the inhabitants; and if this is so, then the principle ought to apply, *a fortiori*, to large towns. At present these interests conflict; and it is universally experienced that someone has to pay for this.

Let us try and examine this a little more closely. If electric light and gas interests harmonize, the first advantage that suggests itself is the ready-made central station—viz., the gas-works. It is then necessary to establish distributing-stations at suitable points in the town. Each distributing-station would consist of gas-engines and dynamos and regulating apparatus. Each distributing-station would supply its own network of mains for the needs of its own neighbourhood. These networks would have to be connected by a trunk main, so that any one station could be relieved by any other in case of emergency, and during the period of light load. The details of the plant of each station and the number of stations would be dictated by local conditions, so that it is impossible to do more than state the broad principles. As there would be no boilers, no chimney stack would be required. Probably in nine cases out of ten, the basement of some house could be adapted to accommodate the necessary plant; hence a great saving would be effected in special buildings. Further, the labour required would be diminished. The cost of superintendence would probably remain the same, but might be increased.

Now as to the cost per unit delivered. There is fortunately not much difficulty in determining this, as many examples of the generation of electrical energy by gas power now exist. The author has selected the results of the weekly records of a plant at Bradford supplying 300 lamps. The total cost per kilowatt hour delivered is almost exactly 2d., with town gas at 3s. 3d. per 1000 cubic feet. But to adapt this to a distributing-station 5 per cent. should be added for loss in mains; and 0·3d. per kilowatt hour for depreciation in plant and buildings. This would bring the cost to 2·4d. Adding the very liberal allowance of 0·6d. per kilowatt hour for management expenses, the total cost would amount to 3d. per kilowatt hour delivered. This is a lower figure than that usually realized in practice by any purely electric supply company working under the conditions above assumed; and no doubt this aspect of public electric supply has for some reason or other not received the attention it deserves. In order that the two systems (direct use of gas and, what may be termed, gaso-electric) may be commercially equivalent, the cost of maintenance of the plant, the interest and depreciation and management expenses must be compensated for by the economy in gas consumed.

Now it is frequently thought that nothing can be more economical than the system of sending the gas direct to the burner. But this is far from being true. The miserably low efficiency of the gas-burners is rarely appreciated at its true value. According to Professor Tyndall, the efficiency of the gas-burner is 0·317 per cent. Taking the calorific value of London gas at 620 thermal units per cubic foot, only the equivalent of 10 thermal units reappear as light out of a possible 3100 thermal units in a 5-foot burner. When gas is utilized to produce motive power, its efficiency and that of the incandescent lamp is so superior that a very different result is obtained. The efficiency of a 16-candle power incandescent lamp being about 6 per cent., and assuming a mechanical efficiency of 80 per cent. for the gas-engines and 85 per cent. for the dynamos, including loss in transmission, it is found that about 25 thermal units would reappear as light out of a possible 3100. So that in spite of the three-fold transformation of energy introduced, the final result is increased 2·5 times. This ratio would, of course, be still further increased in the case of arc lamps. The value of these ratios, taking minimum values in the cases of electric generation by gas-engine power, are as follows:—

Character of Burner.		Percentage Increase of Candle Power obtainable by using a Gas-Engine to drive a Dynamo supplying Electric Lamps, as compared with that obtained by Burning the Gas direct.
Gas.	Electricity.	
A good ordinary 5-feet gas-burner, such as a "Bengel" burner.	An incandescent electric lamp, using 4 watts per candle, and giving 16 cand. pow.	Per Cent. 78
A Wenham lamp	An arc electric lamp of the same power as a Wenham gas-lamp.	227

The reason of this is that the chemical combustion of coal gas with oxygen yields a flame in which the undulatory vibrations of sufficient frequency to become luminous are extremely few compared with the heat waves; whereas in a gas-engine it is these heat waves that are transformed into mechanical energy.

The chief points of a gaso-electric system of distribution may be summed up as follows: (1) The generating station already exists, and may be considered as an electric power house. (2) The existing gas-mains are available, hence there is no question of a separate main network being laid as in the case of hydro—or æro—electric supply. (3) The useful efficiency of gas is out of all proportion greater when utilized as a motive power than when burnt direct in burners; and this, in spite of the extra transformations of energy introduced. (4) It is more than probable that, under a system such as has been discussed above, the cost of maintenance, superintendence, and management expenses will be less than under conditions of independent electric supply. (5) By paving the way for the substitution of electric for gas lighting without conflict of existing interests, an incalculable benefit is conferred on the community.

In the concluding portion of the paper, the author observed that, of course, the hydro-electric system may be treated from the same point of view if once hydraulic supply mains exist. But the present efficiency and character of high-pressure water-motors do not suggest the possibility of any very great economy being effected. It must not be forgotten that Van Rysselbergh's claim to economy is based upon a motor efficiency of 80 per cent., which, though not unattainable is very high, and could

not be relied on as an average result in practice. But for large private installations, the energy supplied by the hydraulic power company could be utilized with advantage.

Considerable discussion ensued; and below we report the remarks touching on the portions of the paper given above.

The PRESIDENT (Mr. G. A. Goodwin, M.Inst.C.E.) observed that the distribution of power was so important a question that he was sure the members felt indebted to the author for having brought the matter before them in the various lights he had done. He wished to make a small alteration where the author referred to the efficiency of the gas-engine as a heat machine. The 24 per cent. efficiency given should, he thought, be a little higher, as he knew that 26 per cent. had been reached. Then with reference to the cooling effects of the cylinder jackets, the average was not so high as Mr. Segundo gave—50 per cent.; it would be nearer 35 per cent. He might also add that the percentage of loss of the exhaust gases was about 37.

Mr. EMERSON DOWSON agreed with the author that, in different cases, it was well, and necessary in fact, to compare the amount of heat energy of the fuel which was converted into work; but he thought also that, if they limited themselves to this, they would only get a one-sided idea of the results they were seeking. Taking the steam-engine, the author remarked that it "is usually accounted an extremely wasteful heat machine; but this is strictly not the case." This was a mere statement on the part of the author, which he did not support either by facts or argument; and against this opinion, he would remind the members that Professor Kennedy and others had shown the efficiency of the steam-engine—that was, the amount of heat energy of the fuel it converted into work—to be much over 30 per cent; but, in actual work, its efficiency ranged from 5 to 15 per cent. In the case of the gas-engine, Professor Kennedy told them that the possible efficiency was something over 80 per cent. (not 60 per cent. as Mr. Segundo mentioned in the paper); and they could compare this with the 30 per cent. heat efficiency of the steam-engine. In practice, the gas-engine efficiency ranged from 20 to 30 per cent.; and this they might compare with the 5 to 15 per cent. of the steam-engine. It was doubtless well to know the consumption of ordinary town gas per horse power in a gas-engine; but he (Mr. Dowson) confessed that he failed to see the use of comparing the amount of heat energy of the fuel used in a gas-works with the energy converted into work by the gas-engine. The coal at the gas-works yielded tar and other valuable bye-products, besides coke; and it also had given to it a high candle power for lighting purposes, which added very little to its calorific value for engine use. This, he thought, pointed to the necessity of taking into account the saleable value of the gas, as well as its calorific power. The author was, of course, right in saying that, as a machine for converting heat into work, the gas-engine driven by town gas, had a high efficiency; but surely the working cost should be taken into consideration also. No doubt gas power had many advantages; and when a good gas-engine was driven by town gas, one was almost tempted to say the conditions of working were ideal. No great space was required for a boiler; no chimney was needed; there was no boiler to clean or repair; no boiler insurance; no clinker or ashes; no fireman to pay; the engine might be started at any moment; and there was a large storeage of power in the gasholder. But the "ideal conditions" were largely discounted when the price of gas was high; and the leading makers of gas-engines frankly stated that, when the price of gas was above 3s., it was more expensive to drive a gas-engine of 14-horse power nominal and upwards than would be the case to work a steam-engine of the same size. The fuel in the form of town gas was, in that case, too dear compared with the coal that was used as fuel for steam-engines. This brought them to the consideration of generator gas, which could be made as easily and as quickly as steam could be raised in a boiler; and it was also much cheaper than town gas. For engine work, generator gas was made from anthracite or from coke. But in considering the efficiency of working with anthracite, the author had assumed that 1 lb. would yield about 16,000 heat units; whereas he (the speaker) thought he was right in saying that it was usually taken as 14,000; and he should be much obliged to Mr. Segundo if he would give him his authority for the 16,000 units. On the basis of 14,000 heat units per pound of anthracite, the loss of heat energy in the process of making generator gas was about 20 per cent.—in other words, the efficiency of the gas plant was, under the usual working conditions, about 80 per cent. Now the gas plant might be said to be to the gas-engine what the boiler was to the steam-engine; and they might compare the efficiency which he had given for the gas plant with the efficiency which Professor Kennedy gave for the steam-boiler.

Mr. BRYAN DONKIN pointed out that the author had stated that the efficiency of the "gas-generator" was about 35 per cent.; but he did not know whether he referred to Mr. Dowson's generator, or to gas-works retorts. Then he added that "the real efficiency of the gas-engine and boiler is, so to speak, 7 per cent." This was rather an awkward way of putting the matter; and it was likely to be misunderstood. [Mr. SEGUNDO: I should have said the equivalent of the boiler.] The author also put the loss due to the cylinder jackets of the gas-engine at about 50 per cent. This was put up a little too high; but it varied considerably with different engines. It was likely to be 30 or 40 per cent. in the cylinder jacket; and 30 or 40 per cent. on the exhaust also. This would leave about 20 per cent. efficiency; 26 per cent. was very high. The most important part of the paper, however, was the suggestion to combine the gas and electric light interests; and it seemed to him (Mr. Donkin) to be well worth working out. This had been to some extent done in Switzerland. They had there adopted the plan of giving, through the same mains, a gas at a cheaper rate during the day time than during the night time, for power and cooking and heating; and it seemed to him that it was a plan that might be adopted with advantage in some of the towns in England. There was one other point. Mr. Segundo had quoted Professor Tyndall as having stated that "the efficiency of the gas-burner is 0·317 per cent.;" but he did not tell them what burner it was.

Mr. FRANK MEAD, calling attention to the statement that a ton of coal might be said to produce 9500 cubic feet of gas, said that Mr. Segundo made a certain calculation, showing that there were 1722 thermal units to be accounted for per cubic foot of gas. But one speaker had called attention to the fact that, although the theoretical value was taken at 14,000 thermal units per lb. (by the way, 14,500 units in other places in the paper), the whole of the value of the coal was not taken. The author had calculated the value of the coke; but there was no account taken of the value of the tar, which had a high thermal value. Now if they took 10,000 cubic feet of gas per ton of coal, and also the thermal value of the tar, which was also a saving (about 100 lbs. of tar per ton of coal), he thought they would obtain a result of 43 per cent., instead of 35 per cent. Coming to the question of the energy obtained from town gas, no reference had been made to the very interesting and instructive address, delivered by Mr. Denny Lane before The Gas Institute last year, upon the subject of the distribution of power for electrical purposes by means of gas-mains; and he would commend that address to Mr. Segundo's attention. He was, however, quite willing to take the figures which Mr. Segundo had given. He stated that at Bradford there was a plant supplying 300 lights; and the total cost per kilowatt hour was 2d. (that was a low price), with town gas at 3s. 3d. per 1000 cubic feet. Now was it not possible to reconcile the gas and electric light interests? He (Mr. Mead) thought that it was; and he had endeavoured to move a Town Council to that way of thinking. He believed there was a possibility of gas companies supplying gas at a reasonable rate, and that gas being turned into motive power, and then into electric light at a price that would make such a scheme quite feasible, at any rate in country towns. It seemed to him that, if the cost were taken at 3d. per kilowatt hour, plants could be installed in hotels and other large establishments, and gas could be supplied for generating electricity, at 50 per cent. of the price the proprietors would pay for electric light on the ordinary current. He had been approached by an electrician, who said to him: "You are supplying gas in a town where the Electric Lighting Company are supplying electricity at 7d. per unit; and, if you like, I can show you, the hotel people, and the large users of the electric light, how you can put down a gas-engine and generate the current at about half the price. Why should you not, as a Gas Company, push this matter? This is a business in which you can beat the Electric Lighting Company on their own ground, at half the price." This was rather a startling statement; and he (Mr. Mead) did not think that gas engineers were alive to the fact that they had such a power in their hands. He thought Mr. Segundo had confirmed this view, that gas companies would be forced into the position of suppliers of the electric light through their gas. He knew several gas companies who could supply themselves with gas at 1s. 6d. per 1000 cubic feet, and obtain a profit on the electric light business, if they had it in their own hands.

Mr. W. H. PATCHELL gave the results of two tests which he had made, in order to show what might be done with gas as an illuminating agent, or by using a gas-engine and dynamo. One was a 6¾-hour test; and the gas used per electrical horse power per hour would now, he said, certainly make dynamo and gas-engine manufacturers ashamed. It worked out at 35 cubic feet. The gas used in the 6¾ hours would, taking 6 cubic feet per hour, be equal to 394 lamp-hours; while, as a matter of fact, it afforded light, with 16-candle power electric incandescent amps, for 790 hours, which was just two to one. The second test (which was a 7-hour one) came out at 478 lamp-hours; and 826 electrical.

Mr. J. N. SHOOLBRED said he was not able to distinguish clearly in several places where Mr. Segundo had been speaking of ordinary gas and Dowson gas; and the paper did not point out plainly, to his mind, the considerable difference there was in the relative quantity of gas used—that it required four times the quantity of Dowson gas over ordinary town gas to do the same amount of work. Then, again, he did not state that the cost of anthracite (which they preferred in the North of England to use for making Dowson gas) was three or four times that of ordinary engine coal in those localities; and this might account somewhat for, as the author seemed to express it, the 20 per cent. efficiency of the Dowson gas system. With regard to the figures that had been given as to an installation of electric lighting at Bradford, he said that some of these required a little modification, as the nominal cost of gas, with discounts, was 2s. 2d. per 1000 cubic feet, and not 3s. 3d., as stated in the paper. He could not agree with some of the

speakers as to the advisability of the policy of putting the electric light interest into the hands of gas companies, for the reason (not that he thought they would do any injustice to the electric interests) that they had a large amount of money invested in the gas interest; and would it, he asked, be fair for gas managers to try and push a competitor in the field, and abandon the interests of the amount of capital with which they were already entrusted. It was decided by Parliament some time ago that it was not consistent with proper progress that a competing interest should be placed in the hands of those who had a large amount of existing capital under their care.

Mr. BEAUMONT, speaking on the question of efficiency, remarked that they always expressed the efficiency of the gas-engine thermally with regard to the number of heat units that (say) a cubic foot of gas was supposed to give, and the number of heat units represented by the work done for that cubic foot. But, as Mr. Segundo pointed out, if they worked the gas-engine in regard to the cost of the coal required to make the gas, then the efficiency of the engine turned out to be a very different thing to that with which they usually accredited it. He (Mr. Beaumont) thought that this was a point which ought to be placed at its proper value as a new and useful way of looking at the matter. He agreed that a good deal more should be done by gas companies in electric lighting; seeing that they had so much plant that was necessary for distributing that which could be economically converted either into electric light or electrical energy. Only a few days previously, he was at the Burton-on-Trent Corporation Gas-Works, the Engineer of which was taking great interest in the matter, with the result that an installation had recently been completed adjoining the gas-works. They were utilizing the very fine coke that was sifted from the coke sold, or what might be considered gas-works refuse; and in this way the cost of the engine power was—at all events at present—very low. It was quite possible that, after a time, the Corporation might consider the adoption, at distant places where they had gas-mains laid, of some such suggestion as Mr. Segundo had made, as it might be economical to employ gas-engines, instead of putting down somewhat costly electrical mains. He understood that they were doing the same kind of thing at Morecambe Bay.

Mr. H. O'CONNOR thought this was more a question of the price at which a given article could be supplied by different systems than the number of thermal units that was to be obtained. With reference to the loss in distribution, he believed that in the case of electricity it would possibly be 20 to 25 per cent.; while with gas and hydraulic power, it would be less—perhaps from 10 to 20 per cent. Then there was the question of the cost of the mains for the same distance and for a corresponding power. For electrical-mains, the cost would be about five times that of gas-mains; and in the case of hydraulic power, the mains would only take something like one-fifth of the power that could be delivered by gas-mains of similar size, besides which they would have to be made much thicker to stand the pressure put upon them. He should have liked some further particulars respecting the comparison which Mr. Segundo had given as to the light afforded by different lamps in using the gas direct and employing it as power for supplying electricity—especially in regard to the 227 per cent. increase of candle power in the case of the electric arc light.

Mr. W. SUGG remarked that some years ago Dr. Siemens and himself came to the conclusion that, if gas was turned into electric force, the same amount of light could be obtained as if it was used direct in a standard Argand burner; but no doubt, if a high-power regenerative burner was used, it would be still greater in favour of the gas. Then, as to the question of the usefulness and applicability of gas under all circumstances, of course it depended greatly on the situation. For instance, it would not be so easy to put a gas-engine in a court or alley, as it would be to lay an electric main. As to gas companies going into electric lighting in the way suggested by the author, he had advocated it for some years; but it was difficult to get many of the companies to see that they must do it. In nearly every town, there were many quarters to which it would not pay to lay an electric main; but where, if the electric light was required, a gas-engine could be used to generate the power.

Mr. A. P. HEAD referred to some comparisons he had made of eight different means of obtaining light; but time would not permit him to give more than a brief outline of the results. He has since kindly forwarded us a copy of the notes which he had prepared; and these, which are of an interesting nature, we have pleasure in publishing. They are as follows: The efficiency mentioned by the author, as expressed by the ratio of what one gets to what one pays for, is, in my opinion, the most useful of all, regarding as it does the question from the point of view of the consumer and payer of bills. On this idea, I have drawn up a comparison between eight typical forms of artificial lighting, taking as my standard the number of hours for which a light of 16-candle power can be maintained for 1d. I have excluded electric arc lights as not yet suitable for domestic use. The results in the following table are to me rather surprising. In the case of the glow lamp driven by town-gas engine, the petroleum engine, and the Dowson-gas engine, I have taken Mr. Segundo's figure of 1d. per Board of Trade unit for establishment charges, in addition to cost of fuel. The details of the petroleum and Dowson-gas engines are derived from figures published by Professor Unwin and Mr. Dowson, and those of the incandescent gas-light by Professor Renk. The result of the duplex oil-lamp is taken from experiments made by myself, and is only approximate. It will be seen by glancing down the fourth column of the table that the incandescent gas-light stands first for economy. The glow lamp driven by Dowson-gas engine, though second, is more than twice as costly; while that worked from a central station supply is the most expensive of all, costing eight times as much as the first named. The ubiquitous oil-lamp stands well up in the list; while the Argand and glow lamp driven by town-gas engine are practically equal. The reason of the high efficiency of the incandescent gas-light is probably the same as that advanced by Mr. Segundo to account for the superior economy of the electric light derived from gas-engine power over the light obtained from the same gas in an ordinary burner. The great heating power of the gas is here utilized to render an infusible mantle white-hot, instead of burning the gas direct for its somewhat scanty light.

Method of Lighting.	Candle Power.	Fuel per Hour.	No. of Hours of 16-C.P. for 1d.
Gas.			
Fishtail or slit	16	8 cub. ft. of gas	4·17
Argand	16	5 " "	6·70
Incandescent gas	55·93	5·29 " "	22·20
Electricity.			
Glow lamp driven by—			
Town-gas engine	16	3·2 " "	6·40
do. Priestman petroleum-engine	16	0·106 lb. petroleum	8·00
do. Dowson-gas engine	16	0·141 lb. coke	10·60
do. Central station supply	16	$\frac{1}{16}$ B. T. U.	2·67
Oil.			
Duplex oil-lamp	17	3·2 liquid oz. petm.	8·85

The assumed prices are those approximately obtaining in London, viz.—
Gas, 2s. 6d. per 1000 cubic feet.
Electricity (central station supply), 6d. per Board of Trade unit.
Petroleum: For Priestman engine, 3$\frac{3}{4}$d. per gall.; lamps, 6d. per gall.

The foregoing comparison may perhaps seem unfair to electricity, if I were not to mention the growing tendency to work glow lamps at higher pressure. A few extra volts give a largely increased candle power, while shortening the life of the lamp. This, however, is of minor importance, now that the price of a 16-candle power lamp has fallen from 3s. 6d. to as low as 9d. in a few months, and is largely outweighted by the increased brilliancy of the light and the decreased number of lamps necessary to illuminate a given area. But apart from this, it is somewhat suggestive that the domestic electric light as now practically available is eight times as costly as the most recent development of gas lighting. Therefore, I would suggest that it will be well to pause before rushing into electric lighting schemes on the assumption that that form of light is, all things considered, the best, but rather try to adapt the existing facilities to the best use. Every town has its gas-works, its mains, and its house-pipes; and if, by a small alteration in the fittings, we can get a brilliant and steady light at one-eighth the cost of the electric light, it seems to me that the days of gas as an illuminant are far from being numbered.

Mr. SEGUNDO, in the course of his reply (which, owing to the length of the discussion, was necessarily rather cursory), said that one or two points which had been criticized seemed to be due to misunderstandings. As to the President's remarks, he was quite aware that 26 per cent. efficiency had been reached in the case of gas-engines. He took rather the efficiency that one might realize with a good gas-engine in working; and he did not think that 26 per cent. could be counted upon in actual working practice. Mr. Dowson had pointed out that Professor Kennedy had stated that the possible heat efficiency in the case of the gas-engine was over 80 per cent.; but he (Mr. Segundo) believed that the figure he had given in his paper was taken from a book recently published by Mr. Donkin, in which case it was merely a ratio. Something appeared to have gone wrong with his estimate as to the calorific value of anthracite. He could not then give his authority for it; but he might have made a slip over the 16,000 thermal units. He thought it was almost needless to say that the 35 per cent. which he quoted as the efficiency of the gas-generator did not refer to Mr. Dowson's plant. No experiments with regard to the efficiency of retorts existed; and he had only calculated for himself a rough efficiency. He quite anticipated that the gentlemen present who were interested in gas would "jump on him" for not taking into account the bye-products. But as far as the working of the gas-engine was concerned, these had no value whatever, though, of course, they were valuable in assisting to pay the shareholders' dividends.

The author was then heartily thanked for his interesting communication.

The Managership of the Braintree Gas-Works.—We learn that the vacancy caused in the managership of the Braintree Gas-Works by the death of Mr. G. Eraut, as noticed elsewhere, has been filled by the appointment, by the Managing-Director of the Company (Mr. Jabez Church), of Mr. William Surman, a pupil of Mr. C. Stafford Ellery, of Bath, and son of Mr. Surman, of the South Metropolitan Gas Company.

REGISTER OF PATENTS.

Gas-Engine.—Crouan, H. M. L., of Paris. No. 8967; May 4, 1893.

The principal claims for this invention are: (1) The arrangement for actuating the exhaust by means of an eccentric mounted on a shaft making the same number of revolutions as the motor itself, but having a useful effect only once in two revolutions, by means of the employment of a pinion on the same shaft, and a wheel on an auxiliary axis, raising, at each second revolution by a cam carried thereon, the end of the lever acting on the rod of the exhaust-valve. (2) A governor having a minimum play, and extreme sensibility, and provided with means whereby the speed of the motor may be set to any desired amount. (3) The regulating control of shafting, composed of inverted cones controlled by a fork, acting, if desired, at the same time on the regulator, so as to automatically maintain the constant speed of the workshop shafting, whatever be the speed given to the motor; as also the employment of a tension roller, allowing the starting of the machine and its engagement without shock.

Production of Colouring Matters from Naphthalene.—Johnson, J. Y.; communicated from the Badische-Anilin and Soda-Fabrik, of Ludwigshafen-on-Rhine, Germany. No. 10,996; June 5, 1893.

This invention relates to the production of dye stuffs by the treatment of dinitro-naphthalenes (either singly or in admixture) with certain reducing agents.

In their specification, the patentees say: "Already in the early years of the coal-tar-colour industry, unsuccessful attempts were made to produce useful dyes from the mixture of these nitro-compounds, although such had been obtained from nitro-benzene. Thus in 1861 Troost experimented on the action of alkaline reducing agents on the dinitro-naphthalenes, with a view to the foundation of a practical manufacture. But neither he nor Roussin, Carey Lea, Kopp, and other chemists who made experiments with a similar object, attained any useful result; and all experiments of this kind were abandoned, and for over 30 years nothing more has been published with reference to the solution of this problem. In the meantime, one constituent of the mixture—viz., the so-called 1·4[1] or alpha-dinitro-naphthalene—has come into use in large quantities in the manufacture of naphthazarine (see patent No. 7833, of 1887), of 1·4[1] naphthalene-diamine, and of other bodies. No useful application, however, has been discovered for the 1·1[1] dinitro-compound; and this consequently constitutes a valueless and troublesome bye-product in the above manufactures."

The inventors claim to have discovered processes for the production of very valuable new dyes from this hitherto useless bye-product, and also dyeing processes or methods by means of which these new dyes can be applied in the arts in the manufacture of black cotton goods resisting the action of light, acids, and soap. The statements published by Troost as to the methods he adopted and the products he obtained, describe his initial material as pure dinitro-naphthalene, and gives the method used for its preparation; and from this it can be seen that it was the mixture of dinitro-naphthalenes that he used. From this mixture he obtained red, violet, and blue colours, by the action of a large variety of alkaline reducing agents. The present patentees have not succeeded in obtaining products agreeing in their properties with those described by Troost—either from the mixture of dinitro-naphthalenes or from the separated dinitro-bodies; but by lengthy investigation and experiments, they claim to have discovered that the nature of the reaction and of the products formed varies according to the reducing agent used, the conditions of the treatment, and the relative quantities of the reagents employed. For instance:—

(A) On reducing 1·1[1] dinitro-naphthalene with grape sugar, in a boiling alkaline solution, a dark coloured solution is gradually obtained. A violet precipitate possessing a metallic lustre separates out; and this can be purified by the aid of alcohol. Certain specimens of dye obtained in this way possess the characteristics of being insoluble in soda solution, but soluble in sulphuric acid—giving a blue solution possessing a strong green fluorescence. This dye can best be applied usefully by producing it on the vegetable fibre, by the reaction above described—black to violet-black shades being obtained.

(B) If the alkaline sulphides be used as reducing agents, the nature of the result closely depends upon the conditions observed. Thus if the 1·11 dinitro-naphthalene be treated with a rather dilute solution of sodium sulphide—taking, to one molecular proportion of the dinitro-body (say) about from three to five, or more, molecular proportions of the alkaline sulphide, and if the treatment be effected at the boiling temperature—then, after acidification with a mineral acid and boiling for some time, a dye is obtained which is insoluble in carbonate of soda, though the product, as a rule, contains some dye which is soluble in this solution. It can be purified to a certain extent by extracting with soda solution; but such purification (say the inventors) is superfluous in practical working. Certain specimens of the dye when dry have been observed to constitute a dark powder, with copper-coloured sheen, and to be practically insoluble in concentrated sulphuric acid. This purified dye can be fixed upon cotton, linen, jute, and the like, by treating the dye in a strongly alkaline bath containing up to 25 per cent. of soda (Na_2CO_3), with the addition of grape sugar or similar reagents. If the product be a mixture of the dyes B and C, the same process for fixing it on the fibre can be used; but it is unnecessary to add grape sugar. A dead-black colour can be obtained possessing a very high degree of fastness against the action of light, acids, and soap.

(C) If a more concentrated solution of sodium sulphide be allowed to react, in the cold, on the 1·1[1] dinitro-naphthalene, and taking less of the alkaline sulphide than above-described, under B (say, about from two to four molecular proportions to one molecular proportion of the dinitro body), and the solution be acidified in the cold with acetic acid or a dilute mineral acid, then a dye soluble in soda solution is precipitated. It contains, as a rule, an admixture of dye B; but it differs from this and from dye A in being soluble in hot soda solution. A sample of this dye dissolved in cold concentrated sulphuric acid yields a dirty green solution. It can be fixed upon cotton, linen, jute, and the like in a manner similar to dye B, with or without the addition of grape sugar; and it gives beautiful shades of black. If the 1·1[1] dinitro-naphthalene be treated with cold and more dilute alkaline sulphide solution, then dye A can also be obtained side by side with dyes B and C.

Incandescence Bodies for Gas-Lamps.—Schneider, G. A. E., of Chemnitz, Saxony. No. 12,029; June 19, 1893.

Alluding to his invention, the patentee says: "Incandescence bodies or 'hoods' made from impregnated woven fabric in the usual manner, have the drawback that, after the textile material has been burnt, they form only a skeleton of ashes, which easily crumbles to pieces." To avoid this defect, he produces an incandescence body, which contains (in addition to the ashes) a fireproof skeleton, by a method different from that described in Mactear's patent No. 4124, of 1889.

For this purpose a fabric woven, knitted, or plaited from incombustible threads is repeatedly dipped into a suitable liquid or emulsion, in which finely divided combustible and absorbent fibres are floating or suspended, and thereby coated with a layer of organic fibres, which is subsequently impregnated and dried, and then burnt to ashes.

The fibres may be impregnated, says the patentee, with the usual solution of luminiferous earthy matter, either before they are applied to the solid body or base, or during or after this process; and the liquid or emulsion may contain "a suitable adhesive substance." Or a fabric may be prepared, in which fireproof threads are alternated with threads of combustible and absorbent material; the whole being afterwards dipped into the liquid or emulsion described above.

The incombustible threads may consist of platinum, quartz, asbestos, or other suitable substance; and they may be formed into a flat sheet or a hose, by weaving, knitting, or analogous process.

Automatic Regulator for Gas Water-Heating Apparatus.—Barralet, T. E., of Queen Victoria Street, E.C. No. 12,384; June 23, 1893.

This invention consists of an automatic gas-valve, so arranged that the opening or closing of a water supply likewise opens or closes the gas-supply; also, of a gas regulator or governor combined with it, which is worked by the pressure of gas, so that there is always the same quantity passing the valve—thus preventing the smoke, &c., caused by an excessive pressure of gas, if unchecked.

For this purpose, at or a little above the top of the water-heater is placed a box, with an outlet-tube projecting over the top of the apparatus. Through the bottom of this box, there is a tube, inside which works a plunger or piston, which is forced up by the pressure of the inflowing cold water, and drops by its own weight when the water is turned off. There is also another tube, which runs through the bottom of the box down to the gas-supply pipe. Inside this tube (which extends some distance up inside the box) is a rod connected to a valve, which opens and closes the gas supply. Over the top of the tube there is a dome or inverted cup, to which is connected the rod working the gas-valve; the piston in the water-supply tube being connected to the dome by means of an arm hinged about midway between them, which is so connected to the dome that it will lift the dome but will drop down without it.

The method of working is as follows: When the cold water is turned on by a tap placed outside the box, the force lifts up the plunger or piston, moving the arm and freeing the dome, so that it drops of its own weight. The water then fills the box to the level of the outlet, and then runs out of it into the water-heater. The dome, with the connecting-rod and valve, dropping, allows a way for the gas, which passes the valve and enters the burner of the apparatus. If the pressure of gas is beyond a normal amount, it acts upon the dome (passing up the tube connecting the gas-supply pipe with the box), and, raising it, partially closes the valve, in proportion to the pressure. The gas is prevented from escaping from the dome by the water, which surrounds it, acting as a seal; the outlet from the box being placed high enough to always retain sufficient water in the box. If the water supply is discontinued, the plunger or piston drops; and this moves the arm and closes the gas-valve.

Spreader for Gas-Lights.—Jack, T. B., of Ballymena, Ireland. No. 4408; March 2, 1894.

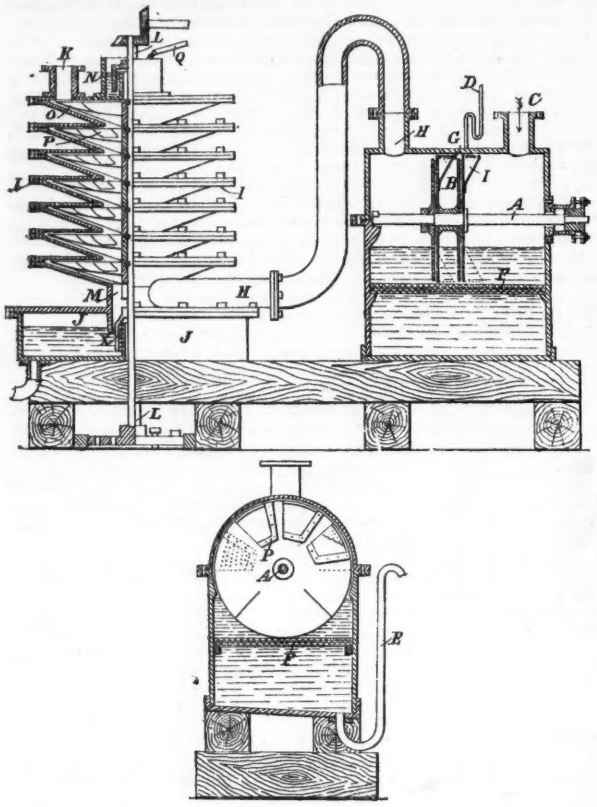
This is another variant of the old "Scholl perfecter." In the words of the patentee: "The invention . . . has for its object the spreading of the flame, to increase the light without turning on more gas. The invention consists in a cap or nipple, made of any suitable material—preferably metal, and lined with asbestos. This nipple or cap is just a little longer and wider than the burner, and fits over the burner." The caps or nipples are constructed of a short length of thin tubing slit at one end to the extent of from ½ inch to 1 inch; the slit end being flattened by pinching it together parallel with the slit, while the end is rounded off to about a semi-circle or more, and finally the opposite end is lined (about ½ inch to 1 inch deep) with asbestos or other fireproof material.

Purification of Gas.—Fleischhauer, E., of Gotha, Germany, and Bernstein, M., of Berlin. No. 4719; April 14, 1894.

This invention consists mainly in a condenser, in which "the gas is freed from the tar and ammonia contained therein, by being energetically agitated and combined with sprayed water."

The casing has mounted horizontally in it a shaft A carrying four rotary discs. Two of these discs are somewhat smaller in diameter than the other two, and are held a short distance apart by intermediate discs. The other two are provided with a series of perforations around their circumference. Arranged over each of these series of perforations is a pocket B, having one side open, and the other closed in (or partially so) by a perforated plate, bent to conform to the outer circumference of the discs, which are of a size to allow a small space between their outer edges and the interior surface of the semicircular cover of the casing. The first two discs are provided near their circumferences with laterally-extending pins, which just clear the back surfaces of the other discs, or else just touch them as both discs revolve together. C is the gas-inlet, and D a water-inlet. E is an outlet-syphon; a continual flow of water being let into the apparatus

which should be kept so as to cover nearly half the discs. Below the discs, and arranged to just clear them, are a series of horizontal hurdles F of sheet metal, which serve to partition off the upper water, which is perturbed by the motion of the discs and pockets therein, and to keep the lower part in a calm state. G is a partition in the casing between the two pairs of discs, to prevent the direct passage of the gas from above the first pair of discs to above the second pair. H is the outlet-pipe for the gas when it has passed the discs—leading to the second part of the apparatus.



This consists of a series of shallow, stationary pans I, built up on one another, and bolted to the under reservoir J. To the top pan, is attached the gas-outlet K. Extending vertically throughout the apparatus is a rotary shaft L, carried below in vertically adjustable bearings, and also at the top in bearings (which are omitted in the drawing for the sake of greater clearness). The apparatus is closed round the shaft at the top by the water-seal N, and in similar manner at the lower inlet throat M. On the shaft are arranged one above the other a series of rotary pans, similar in form to the series of outer stationary pans, and arranged one within each. These pans are provided with four or more inner radial ribs O, and with a similar number of ribs at the bottom underneath. In the bottomless sections I, forming the casing of the apparatus, wings P are arranged to extend downwardly into the rotary pans, and slanted in a direction opposite to that of the rotation of the pans, and also having the side nearer the centre of the apparatus longer than that farther from it. Thus these wings throw the water in the pans outward against the inner walls of the casing when the pans rotate. Q is the water-inlet.

The apparatus works in the following manner: The gas coming from the exhauster enters the casing, and is caught up by the rotating pockets B, and driven by the centrifugal force, partly through the series of perforations in the discs, and partly through the perforated covers C, and impinges against the interior walls of the casing. The gas pressed through the perforations strikes the second disc, and is driven by the centrifugal force through the pins, which thoroughly separate it; a second time against the walls of the casing, whence it passes into the space between the two pairs of discs, after which it undergoes the same operation again from the second pair of discs. During this operation, the pairs of discs are continually spraying water against the interior walls of the casing. The gas, on being thrown against the damp walls with the sprayed water, is freed from the tar contained therein, the molecules of which are caused to combine and separate out. At the same time the walls are being continually played upon by the water; and thus the tar deposits are continually washed off. As the tar sinks in the water in the bottom of the apparatus through the hurdles F, the upper spray water will always be to a certain extent clear; the hurdles preventing the perturbation from extending below the upper water, and thus hindering the stirring of the whole mass of water, and allowing the tar to sink quietly to the under water and remain there undisturbed, to be drawn off by the syphon. The gas having passed the first part of the apparatus flows along the pipe H, into the reservoir J at the bottom of the second part. Here it ascends the throat M, and passes upwardly round each of the pans successively to the outlet K at the top. In its upward passage, it first meets the under ribs of the lowermost pan, which is rotating; and consequently it drives the gas stream outwards and upwards between the pan and casing. Arriving at the top of the pan, it meets the sprayed water from the interior ribs O and stationary wings P. The gas receives the same treatment in passing each of the pans successively; and in this manner it is freed from the ammonia contained therein. Thus the purest gas at the top of the apparatus meets the pure water entering the casing at Q; and the lower the water sinks in the apparatus, the more ammonia it contains.

Gas Apparatus for Warming Rooms.—Bray, G., of Leeds. No. 6440; March 31, 1894.

This invention has for its object the more effectual warming of rooms and the like, "by the circulation through pipes (similar to the circulation of hot water through hot-water coils) of the heated products of the combustion of gas and air, whereby the heat is gradually abstracted therefrom, and the products of combustion and air are passed into a chimney or the outer atmosphere comparatively cool."

The gas is consumed (by preference) by means of ordinary gas-jets placed in the fire-box in the middle of the lowest pipe or pipes. The fire-box is provided with a door in front, perforated for igniting the flames, and so that the flames may be seen from the outside. The fire-box has also a perforated bottom, for the purpose of supplying, in a steady current, the air for combustion. The heated products of combustion and air are carried from the fire-box to the right or left, as convenient, into the lowest lines of pipes; and it then flows along the second line, from the bottom of the pipes into the upright, then along the third line, and so on to the top line. The circulation is effected by placing diaphragms in the uprights (as in some water-coils), in such positions as to give an outward and upward to-and-fro circulation to the products of combustion and air. In the centre of the top line of pipes, the outlet to the flue is situated; and thence the products of combustion are conveyed into the atmosphere.

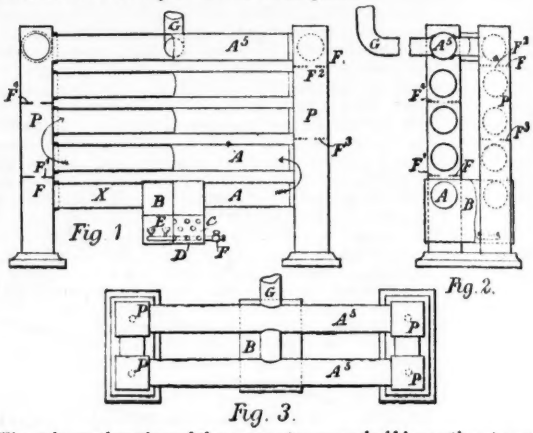


Fig. 1

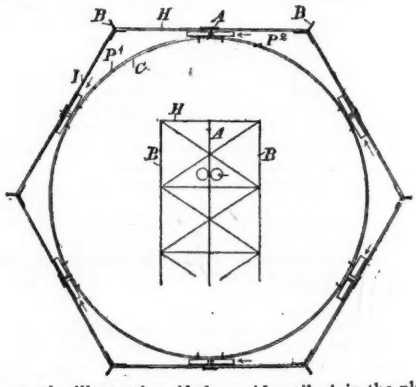
Fig. 2.

Fig. 3.

Fig. 1 is an elevation of the apparatus—one-half in section, to more clearly illustrate the same. Fig. 2 is an end view, also partly in section; and fig. 3 is a plan. The apparatus shown has two series of horizontal pipes, coupled to upright pipes placed at the end. To the bottom horizontal pipe or pipes A is attached a fire-box B, by preference perforated at the door C, and through the bottom plate D. Within the fire-box are a number of gas-jets E, regulated by a tap F; the heated products of combustion rising therefrom into the bottom horizontal pipe or pipes. The major portion of the heated products of combustion pass to the right; then in the direction of the curved arrows through the second row of horizontal pipes A^1; and so on, to the top horizontal pipe A^5 to the outlet G—thus heating the series of pipes, and by them warming the room. The circulation of the heated gases through the horizontal and vertical pipes in this manner is effected by placing diaphragms in the upright pipes P; and in order that the portion X of the bottom pipe or pipes A (shown in section) may be heated, some of the heated gases are made to pass in that direction by forming a small hole F^1 in the first diaphragm F, through which a portion of the gases pass. Provision is also made for some of the heated gases to flow through the portion A^5 of the top horizontal pipe or pipes to the outlet-pipe G, by placing a hole F^2 through the top diaphragm F, thus enabling some of the heated gases to escape through it, and flow towards the outlet-pipe G. The other diaphragms F^3 and F^4 may be perforated or not.

Guide-Framing for Gasholders.—Abel, C. D.; communicated from A. Klönne, of Dortmund, Germany. No. 6549; April 2, 1894.

This invention relates to the arrangement of guide-rails for gasholders, in which "the disadvantages arising from the combination of the guide-rails with the framing standards, as heretofore employed, are obviated."



Referring to the illustration, if the guide-rails A in the plan are not combined with the framing standards B, but are placed in the sides of

the framework, they are brought nearer to the bell of the holder, and the extended brackets for the bearings of the rollers are dispensed with. It is also possible to reduce the number of sides of the framework, as the increased distance between the standards B and the bell C, resulting from the use of a polygonal frame having a small number of sides, offers no inconvenience with this arrangement. The smaller the number of sides of the framework, says the patentee, the more accurately the strain to which it is subjected can be calculated; and consequently the material can be more correctly proportioned to the strains it has to bear.

In addition, the guide-rollers P have a much less eccentric action than with the arrangement of guide-rails for tangential rollers heretofore employed; and the pressures exerted by the separate sets of rollers P_1 P_2 are taken directly by the corresponding planes I H of the framework, which fact considerably increases the possibility of accuracy in the calculations.

A particular advantage also results from the fact that the guide-rails are supported at double the number of points for the same height of framework as compared with existing constructions shown in the detail drawing; and consequently the bending strain to which they are subjected is much smaller. The standards B are only subject to longitudinal strains with this construction, and so are greatly simplified.

APPLICATIONS FOR LETTERS PATENT.

10,214.—Habgood, W., and Smith, S. C., "Gas and oil engine exhaust purifier." May 28.

10,427.—Medhurst, F. H., "Composition for so-called incandescers for oil, gas, or other lamps." A communication from L. Chandor. May 29.

10,447.—Grundy, J., "Gas heating-stoves." A communication from H. Heim. May 29.

10,484.—Garnett, T. A., Forster, G., Lister, D., Taylor, H., and Birchall, F., "Carburetting coal or other gas." May 30.

10,497.—Mare, F. de, "An ejector gas-burner." May 30.

10,519.—Roche, C. de la, "Mantles for incandescent gas lighting." May 30.

10,550.—Willatt, W. H., "Generation of gases for heat-engines." May 31.

10,555.—M'Dougall, A., "Manufacture of salts of ammonia." May 31.

10,587.—Moeller, J., "Burners for incandescent gas lights." May 31.

10,630.—Dobbie, R., "Gas-stoves." June 1.

10,702.—House, H. A., House, A. A., jun., and Symon, R. R., "Gas or vapour burners." June 2.

10,788.—Henriod-Schweizer, F., "Gas and hydrocarbon engines or motors." June 2.

The Electric Light Installation at Burton-on-Trent.—On Friday, the 2nd inst., the Contractors for the electric lighting works of the Burton-on-Trent Corporation (Messrs. J. Fowler and Co., of Leeds) invited the members of the Town Council to inspect the generating station, which is now finished. The boiler-house contains three steel Lancashire boilers, working at a pressure of 100 lbs. per square inch; while in the engine-room are three pairs of compound horizontal engines of 106 brake horse power, and running at 90 revolutions per minute. They drive the dynamos, by means of cotton ropes, at the high speed of 450 revolutions per minute. These dynamos generate electricity at a pressure of 2000 volts, with about 75 alternations per second. The specifications and plans were prepared by Mr. F. L. Ramsden, the Corporation Gas and Electrical Engineer. At the close of the inspection, the company were entertained at a banquet.

The Oldbury Local Board Gas Undertaking.—At a recent meeting of the Oldbury Local Board, the Gas Committee submitted a recommendation to increase the salary of the Manager (Mr. A. Cooke) to £200 per annum. The Committee reported that they were in a position to repay to the Board the sum of £1055 owing by the Gas Department. The Chairman of the Committee (Mr. J. W. Wilson), in moving the adoption of the report, remarked that Mr. Cooke had filled the position of Manager for the past two years in a manner that was worthy of the confidence they had placed in him. They were very pleased to find they were able to discharge a debt which had been owing to the Board since the commencement of the gas undertaking. In the old days they had found it impossible to repay the money. But the department had been conducted with less capital; and they had now reached a point when they would be able to meet next year's payments without the aid of the amount they proposed to pay back. The recommendation and report were adopted.

The Profits of the St. Helens Corporation Gas Department.—At the last meeting of St. Helens Gas Committee, a statement was submitted showing that the net profit for the past financial year had been £1917. It was resolved to distribute the profit as follows: £867 to the gas-works capital account (being £406 for the extension of ordinary mains and services, and £461 towards the cost of the oil-gas plant), and £1049 to be appropriated as the Finance Committee may direct. The Chairman (Alderman Cook) submitted a new scale of discounts on consumption, in order to be fair all round, as follows: To consumers of from 20,000 to 50,000 cubic feet per annum, 5 per cent.; from 50,000 to 100,000 feet, 7½ per cent.; from 100,000 to 1,000,000 feet, 10 per cent.; and above 1,000,000 feet, 12½ per cent. This scale was adopted; and the Town Clerk reported that he had ascertained that the granting of these discounts would lead to an immediate additional consumption of 5 million cubic feet per annum. These results may be regarded as very satisfactory, seeing that the coal strike was the cause of a falling off to the extent of 6½ milllon cubic feet in the sale of gas during its continuance, as compared with the corresponding period of the previous year. The nominal price is 2s. 8d. per 1000 cubic feet; but with the new discounts it will be about 2s. 5d. Meters are supplied free. We may add that the illuminating power of the gas has been close upon 19 candles ever since the adoption of the Peebles oil-gas process.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Incorporated Gas Institute.

Sir,—In your editorial remarks in the Journal this week, you refer to my consent to act, if required so to do, under the direction of the Council of the Institute; and to these I think it necessary to reply.

When the Gas Companies' Association was given up, it occurred to the Council of the Institute that some of its proceedings might be continued, to the benefit of gas companies generally; and at one of their meetings, in which the matter came under consideration, it was said that, before undertaking to do the work, it would be desirable to ascertain of what the work consisted. As the Secretary of the late Association had then been relieved of all responsibility, it was felt there need be no hesitation in asking him for an explanation; and this was accordingly done.

In reply, I gave a full explanation of the work done—pointing out such parts as I thought might be followed up with advantage. I also stated that, as the Testimonial Fund which is referred to in your remarks had been dealt with in a manner that did not relieve me from further work—but, on the contrary, made it necessary for me to take up any other work that might be offered—I was then thinking of undertaking such part of the work as I thought necessary, at my own risk, on a very small subscription.

After some delay, I was asked if I would meet a deputation at the Institute's offices in Westminster; and, in reply, I explained my loss of hearing, but was told that this would be easily remedied. I therefore consented. I attended a meeting, and am pleased to say there was very little trouble (only delay) in arriving at a clear understanding of what the deputation proposed. I explained what I thought would be required, and was asked: "If the Institute decide upon taking this matter up themselves, would you be willing to do what is required until such time as they are able to make other and more suitable arrangements for the purpose?" I very readily consented.

The deputation made it quite clear to me that they could not come to any definite arrangement themselves; but that the matter would have first to be approved of by the Council, and after that by the meeting. If, however, the proposal is not approved of, there is an end of the matter. The Institute thus are under no obligation to me; but, on the contrary, they are free to act in any way they think fit, though I need scarcely say that I should be glad of their approval.

Nothing was said to me about the intention to form another Association, nor did I know anything about it. On the contrary, I have read (I believe) all your articles about it; and the impression formed in my mind has always been that you were much opposed to it. The only matter explained to me at the meeting was that there ought only to be but one Gas Institute, to represent all matters relating to gas; and that some arrangements were in progress for this purpose. With this I fully concurred.

June 8, 1894. Wm. Livesey.

Sir,—I beg to express my satisfaction at your editorial comments on the report of The Gas Institute Council. The proposal in regard to taking up the old Gas Companies' Association and its parliamentary work (?) is, as you say, about the silliest sign of "aberration of intellect" that I have ever come across. The "taking up" is outside the Institute altogether. Why should the subscriptions of members be spent in paying for work which is altogether the business of gas companies? Fancy a grocer's assistant having to pay a yearly subscription to an association for the protection of his employer! If another Gas Companies' Association is constituted, then by all means let the parties benefited—*i.e.*, the gas companies—pay for it. There are a vast number of gas managers—I should think about 99 per cent.—who have to pay their own subscriptions and expenses in connection with The Gas Institute; and why their hard-earned cash should be spent for a Gas Companies' Association, I know not. Certain it is that the gas companies themselves do not desire it, and have never, by word of mouth, approached the Institute for help in such a matter. The Council have made a "blunder of the first magnitude," equalled only by the constitution of a permanent honorary secretaryship. When Mr. Longworth resigned, it was distinctly understood that the position should lapse—it being neither useful nor desirable; and I am informed that the present Honorary Secretary felt and spoke most strongly on the matter in favour of expunging the position. I am glad to see some good old names on the Council election list; and I thoroughly agree with you as to the "superfluous folly" of the prosposed members' certificates.

June 7, 1894. An Old Member.

The Mayor of Wolverhampton and his Report on Gas and Electric Lighting.

Sir,—I beg to enclose for insertion in the Journal, if you think it suitable, copy of a letter which I have sent to the Mayor of Wolverhampton, Mr. C. T. Mander. George Bray.

Leeds, June 6, 1894.

[Enclosure.]

ELECTRIC LIGHTING v. GAS LIGHTING.

To C. T. Mander, Esq., J.P., Mayor of Wolverhampton.

Dear Sir,—I have been favoured with a copy of a "Report of the Mayor (Mr. Alderman C. T. Mander, J.P.) to the Lighting Committee of the Council, Showing the Advantages of Electricity as an Illuminant Compared with those of Gas." The report is also inscribed "With the Mayor's Compliments;" and has upon it the Wolverhampton coat of arms. There is therefore no doubt as to the report having been issued by you in your official capacity; and it will, therefore, have greater weight.*

I regret, for the dignity of the mayoral office which you hold, that you should have issued a report in your official capacity having about it the puffing characteristics of prints which gas-burner hawkers trouble the

*This report was referred to in our "Electric Lighting Memoranda" last week p. 1061.—Ed. J.G.L.

country with every lighting season. I do not wish to be offensive; but it is due to the people of Wolverhampton, and your Lighting Committee, that I, whose manufactures you refer to, should tell them that your report is grossly inaccurate, misleading, and prejudiced, and well calculated to lead your constituents wrongly to discard their useful, valued, and cheap servant, gas-light, for the beautiful, expensive, less useful, and erratic luxury, the electric light.

Whilst thinking over your fulsome praise of the electric light, I had a prospectus sent me for the new Company of "Thomas Parker, Limited," of Wolverhampton, formed "to carry on the business of manufacturers of plant for electric lighting," &c., with a capital of £75,000, with yourself "Charles Tertius Mander, Esq., J.P., Mayor of Wolverhampton, Chairman." I am not going to suggest that the coming together of your mayoral report, with your official condemnation of gas lighting, your inordinate praise of electric lighting, and your Chairmanship of the Electric Lighting Apparatus Company, Limited, are anything more than Heaven-sent coincidences; but I will say that a censorious public would have had more confidence in your mayoral report had these coincidences not taken place.

In your inflamed haste to puff electric lighting, and to condemn lighting by gas, you appear to have forgotten that, with scientific subjects—unlike your local politics—it is necessary to be accurate, and to have a knowledge of your subjects. But absence of knowledge and inaccuracy are, as I have said, displayed throughout your report, and almost in every paragraph.

As an instance of your want of knowledge, you (on page 2) gravely and elaborately set before your readers, as a "startling" fact, the elementary truth—which appears, in an inaccurate quotation, as coming from me—that the consumption of an ungoverned gas-burner "depends on the pressure!" Any student of physics knows this; and any plumber knows it. Yet to confirm this simple truth, you gravely "asked the Assistant Borough Engineer, Mr. Frost, to take careful observations at the School of Art," which was done with quixotic minuteness and display, and duly set forth in your report.

Having made your elementary discovery, you build upon it several fallacies in the following extraordinary sentence (at the bottom of p. 2): "I need hardly point out that the extra 3·64 cubic feet per hour [consumed by increasing the pressure] does not give 72·8 per cent. extra candle power, and is not only wasted and passed into the air inefficiently burnt, but gives off an extra percentage of noxious fumes."

You are wrong as follows: Firstly, the extra gas consumed is not "wasted," but only has its value diminished, which shows, to an ordinary mind, that it ought not to be used in that reckless way. Secondly, it is not "passed into the air inefficiently burnt," in the sense you mean, but is burnt more completely, and too rapidly for lighting purposes. Thirdly, the extra gas so burnt does not "give off an extra percentage of noxious fumes." The percentage is rather less than more. I give these flat denials merely because your assertions cannot be the result of any scientific proof; and to argue the points would be waste of time.

In the sentence quoted, you clearly show that you are aware that too much pressure at the burner is detrimental to the lighting value of the gas. Yet when you compare the cost of lighting by gas with that by electricity, you secure your results by thus misusing the gas, and by adopting the figures of others who have misused it; and, with figures so obtained—making gas nearly 50 per cent. worse than its proper value when used under proper conditions—you compare them with electric light figures taken when that light is at its best, and much better than can be secured in ordinary use. In fact, you make one of the very best features of gas lighting—a surplus of pressure properly used—into a grave defect, by unfairly manipulating it. It is, therefore, my duty to tell your Committee and your constituents that you have done this, and also, what you ought to know—that by the use of proper burners, costing less than 3d. each, and a small amount of common sense, they can always obtain, whatever the pressure may be, a light within 10 per cent. of the stated power of the gas, and in some cases 10 per cent. more than its stated power.

In dealing with the value of the electric light, your Worship always puts it at its theoretical best. You do not warn your constituents nor Committee that the electric lamps, from the time they are first lighted, rapidly increase in electrical conductivity, and diminish in lighting value, until at the end of (say) 250 hours' use, it is cheaper to put new lamps in than to continue the use of the old ones. Nor in making your comparisons for lighting value do you knock off about 40 per cent., as you ought to do, for the above and other defects. But I happen to know many cases in which the increasing charges month by month have taught this lesson, and have taken away much of the charm from the electric light.

As you have given your opinion to your Lighting Committee and constituents regarding the relative cost of the two systems of lighting, and have connected our burners therewith, I will give mine, with no feeling of hostility to our charming rival, and with perhaps a much wider practical experience than you can lay claim to. It is that, under ordinary general circumstances, and with 16-candle gas at 2s. per 1000 feet, electric lighting at 8d. per unit is about four times the cost of gas lighting, and that the adaptability of the latter to the general purposes of life is much superior to the former. As an expensive luxury, and where people can pay for it, the electric light has advantages over gas which I have pleasure in acknowledging.

Your taste may well be questioned in making such a wide spreading and unjust attack as you have done, as Mayor of Wolverhampton, upon one of the most important industries of the country; and this attack must be looked upon as mainly affecting the important gas industry in your own town, in which large sums of your own ratepayers' money are invested. The wild, rough, and slogging strokes which you wield against a town's industry, and, as it now appears, a trade opponent, are unworthy of your position as Mayor of Wolverhampton.

Whether the electric lighting apparatus has improved more than that of gas during the past ten years is open to doubt. But I know that gas-lighting apparatus has enormously improved; and I believe its prospects from further improvements are such as should make all local authorities, at least, very chary of spending the ratepayers' money on electric lighting projects. And they should be particularly careful not to be guided by such figures and statements as you, Mr. Mayor, make in condemnation of gas, and in praise of the electric light, whilst holding your dual offices of Mayor of Wolverhampton and Chairman of Thomas Parker, Limited, Electrical Apparatus Manufacturers.—I am, dear Mr. Mayor, yours truly,

Leeds, June 4, 1894. (Signed) GEO. BRAY, Gas Lighting Engineer.

Guernsey Water-Works Company, Limited.—A Company has been registered under this title, with a capital of £20,000, in £10 shares, to carry on in Guernsey the business of a water company.

A Railway Siding for the Blackburn Gas-Works.—The Blackburn Town Council, at their meeting last Thursday, resolved to apply to Parliament for power to construct a siding from the Lancashire and Yorkshire Railway to the gas-works, at an estimated cost of £25,000. The Corporation have hitherto paid over £2000 annually for cartage; and it was stated that the proposed siding would effect a saving of £600 per annum.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Electric Lighting Provisional Orders (No. 2) Bill, Local Government Provisional Order (Gas) Bill, Plymouth and Stonehouse Gas Bill.

Bills read a second time and committed: Bury Corporation Bill, Electric Lighting Provisional Orders (No. 1) Bill, Neath Corporation Water Bill, Torquay Gas Bill.

Bills reported: Dundee Corporation Bill, Electric Lighting Provisional Orders (No. 1) Bill, Fulwood Local Board Water Bill.

Bills read the third time and passed: Accrington Gas and Water Board Bill, Paignton Gas Bill, Pontypridd Water (Tramroad) Bill.

A petition has been presented against the Neath Corporation Water Bill, from the Briton Ferry Local Board.

HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Accrington Gas and Water Board Bill, Huddersfield Water-Works (Tramroad) Bill, Pontypridd Water (Tramroad) Bill.

Bills read a second time and committed: Bacup Corporation Water Bill, Kendal Corporation Gas and Water Bill.

Bills referred to a Select Committee, consisting of Mr. Bramston Beach (Chairman), Mr. Cornwallis, Mr. Johnson Ferguson, Mr. E. Blake, and Mr. Bonham-Carter (Referee); to meet on Tuesday, June 12: Abertillery Local Board (Gas and Water) Bill, Newcastle and Gateshead Water Bill, Wakefield Corporation Bill.

Bills reported: Aberdare Local Board Water Bill, Ambleside District Gas and Water Bill, Colne Valley and Central Middlesex Water Companies Bill, Edinburgh and Leith Corporations Gas Bill, Electric Lighting Provisional Orders (No. 2) Bill, Millom Local Board Bill, Preston Gas Bill, Swinton Local Board Bill, West Middlesex Water Bill.

Bills read the third time and passed: Electric Lighting Provisional Orders (No. 2) Bill, Local Government Provisional Order (Gas) Bill, Plymouth and Stonehouse Gas Bill.

HOUSE OF COMMONS COMMITTEE.

(*Before Sir* JAMES KITSON, *Chairman; Sir* J. DICKSON-POYNDER, *Mr.* L. HARDY, *Mr.* BURNIE, *and Mr.* BONHAM-CARTER, *Referee.*)

Tuesday, June 5.

PRESTON GAS BILL.

On the resumption of the consideration of this Bill to-day,

Mr. *H. E. Jones*, in further examination by Mr. CRIPPS, said that for twenty years of his life he had been testing gas every day; it was, in fact, a necessary part of the early career of a gas engineer. He disagreed with Mr. Sugg's statement that the new Argand burner would not affect the supply of gas. As a member of the Board of Trade Committee on Photometric Standards, he had recently approved of the new burner as a standard. The difference between the Preston batswing and this burner was 1½ candles, which would represent 3d. per 1000 cubic feet in the cost of manufacture. Mr. Livesey had suggested 3s. 4d. as the initial price; but, if there was this difference between the burners, the initial price, on Mr. Livesey's own figures (which were based on an unfavourable year), ought to be 3s. 1d. He thought the Company were prudent in lowering the illuminating power of their gas; but, obviously, it was not fair to do so without making the consumers a corresponding allowance. If he was wrong, and there was no difference between the burners, why put the new burner into the Bill? He had made several experiments with gas produced from cannel and common coal. He had the Preston burner, and the best Argand burner he could get from Mr. Sugg; and he had carried out the tests in his London office. He had used a 7-inch chimney, as described in the Bill; whereas Mr. Sugg stated in his evidence that he used an 8-inch chimney. His (witness's) experiments showed that better results could be obtained with the shorter chimney. He also used the "London" standard Argand. Gas showing 17·99 or 18 candles with the batswing, showed 19·98 candles with the new Sugg Argand; gas showing 17·36 with the batswing, showed 19·30 candles with the new Sugg; and gas showing 16 candles with the batswing, showed 18·48 candles with the new Sugg. The last result he attributed to the disability of the Preston burner to do justice to the reduced quality of the gas. He considered that the lower the quality of the gas was, the greater would be the benefit derived from using the Argand. Since the last sitting of the Committee, he had seen Mr. Sugg's photographs and the notes of his experiments. Mr. Sugg had used pentane, which was derived from petroleum, and was not present in ordinary gas made from cannel; and Mr. Sugg, he found, had arbitrarily added half a candle to the record of the old Preston burner before bringing it up to that of the new burner, which he injured by using too long a chimney. The half candle was added to allow for the flickering of the batswing flame. Upon Mr. Sugg's own showing, therefore, the new Argand was more than equivalent to the Preston flat-flame burner. It must be borne in mind that the batswing was used by the poor consumers. With the burner proposed in the Bill, the Company would be enabled to supply a gas which would satisfy the standard, but which, when used in the consumers' burners, would be 1½ candles inferior to the gas which the Company were at present supplying.

Cross-examined by Mr. BIDDER: The batswing burner he had used was supplied to him, by the testing officer of the Corporation, as being the burner with which he was in the habit of testing the gas.

Mr. BIDDER: Would you be surprised to learn that it is not by any means the burner employed for officially testing the gas?

Witness: It was given to me at Preston as the burner of the Corporation. I took it with me, and compared it with the Referees' standard burner for 20-candle gas; and they are identical.

Mr. *Green* was then recalled on this point. In answer to Mr. BIDDER, he said the burner produced by Mr. Jones was not of the description employed for the official testing of gas at Preston. The official burner there was Sugg's No. 6 table-top, which would give better results for 18-candle gas than the burner Mr. Jones had. The Company provided the burners for the official testing; and the Corporation's tester had only visited the works once in about 15 years for the purpose of making the test.

Mr. *Jones*, recalled, said Mr. Sugg had failed in making an Argand burner which would achieve the same results as the batswing; and he was bound to fail from the first. The batswing gave more variable results than the Argand, which was a more trustworthy and consistent appliance to use for gas-testing purposes.

Mr. *A. F. Fowler*, the Engineer to the Corporation, having given evidence as to the obstruction to navigation which the proposed jetty would cause,

Mr. BIDDER, on behalf of the Company, withdrew the proposal for the jetty.

Mr. RUSSELL then addressed the Committee on behalf of Colonel Feilden. He urged that there was no public purpose to be served by granting the proposed new site, and therefore that no sufficient grounds had been shown for interfering with the Colonel's property. If, however, the Company were empowered to acquire the new site, they ought, in justice, to take the whole of Colonel Feilden's estate, which he had recently bought for private residential purposes.

Mr. BIDDER, in replying upon the whole case, claimed that the Company had shown that, within the next 12 or 15 years, they would require to have the new works; and he urged that it would have been wasting money for them to come forward with an incomplete scheme, which would only suffice for a few years. At the outside, the existing works would not last more than seven years; and as it would take some time to purchase the land and build the new works, if the Company did not get powers for constructing them now, they would obviously have to apply again to Parliament within a short period. If the Committee considered that there should be a sliding-scale, the Company would not offer any objection. The question here was what initial price would suffice to pay the statutory dividend under all ordinary circumstances. If the Committee, as in the case of the Crystal Palace Bill, were in favour of a neutral zone—beginning (say) at 3s., and rising to 3s. 4d.—he should offer no objection. The Company were satisfied that the new Argand burner did not give them any advantage over the old batswing, except that there was no fluttering of the flame as in the latter case; and if the new burner were only to be allowed subject to a lower initial price, they would rather strike the new burner out of the Bill.

After deliberating for some considerable time,

The CHAIRMAN announced that the Committee had decided that the Company should be granted powers to purchase the new site, but that the road was to be at the extreme limits of deviation, so as to interfere as little as possible with the property of the Corporation; and the Corporation were to have concurrent use of the road. With regard to Colonel Feilden's land, all was to be purchased if any was taken. The capital powers that would be granted were authority to raise £120,000 at 5 per cent., with the usual auction clauses, and borrowing powers amounting to one-fourth of the subscribed capital. The net standard price was to be, on the "neutral zone" principle, from 2s. 11d. to 3s. 3d. The burner to be used was to be Sugg's Argand, to be adopted according to the provisions of the Bill, with such alterations as suggested by Mr. Sugg. The provisions as to the railway and running powers and the erection of a jetty were to be omitted; and the limits of supply were to be extended according to the Bill.

It was then arranged that the clauses should be taken on Thursday.

Thursday, June 7.

The Committee met again this morning for the purpose of proceeding with the consideration of the clauses.

Mr. PRITT, the Agent for the promoters, stated that the parties had been able to come to an agreement upon nearly all the clauses; and therefore the only matter upon which it would be necessary to trouble the Committee was a small question with reference to the Preston Electric Lighting Company.

Mr. MOON objected to this question being gone into, on the ground that it had already been decided by the Committee. His clients (the Corporation of Preston) very much objected to the clause by which it was sought to enable the promoters to become the owners of the electric lighting installation at Preston, by going to the Board of Trade and getting a Provisional Order. He understood that the Committee had decided that the preamble was not proved so far as regarded the acquisition by the Gas Company of the undertaking of the Electric Lighting Company.

Mr. WHITEHEAD (for the Gas Company): I do not think my learned friend will find that any words used by you, Sir, in giving your decision, related to this matter at all.

Mr. MOON: The position is this——

The REFEREE (Mr. Bonham-Carter): Are you going to speak with regard to the Provisional Order?

Mr. MOON: Yes, Sir.

The REFEREE: Then we do not want to hear you. Because the question of the Provisional Order was not specifically referred to in the decision of the Committee, it does not follow that they intended to strike it out of the Bill. The question was fully considered by the Committee; and their decision as to the powers which should remain therein included the power to apply for a Provisional Order, to enable the Gas Company to enter into an agreement with the Electric Lighting Company for the supply of electricity for lighting purposes.

Mr. MOON: You will remember, Sir, that you have not heard my case as against that.

The CHAIRMAN: Do you mean you are going to discuss clauses?

Mr. MOON: We are altogether opposed to the granting of the power. We say that the clause should be struck out of the Bill.

The CHAIRMAN: You were asked if you opposed this clause, and you said you did not. I distinctly remember your remarks.

Mr. MOON: I do not think we said we did not oppose. I think there must be some misunderstanding with regard to that. It will be in the recollection of my learned friends whether or not we ever said we did not oppose the clause.

Mr. BIDDER: We called our evidence; and as my learned friends who appear on behalf of the Corporation of Preston did not bring forward any evidence upon this question, I think the Committee were perfectly entitled to assume that they did not oppose.

The REFEREE: What is the object of your application, Mr. Moon?

Mr. MOON: To have this question considered, as it has not really been discussed before the Committee.

Mr. BIDDER: My learned friend Mr. Cripps took objection to various other matters; but he did not utter a word of objection to the electric lighting clause.

The CHAIRMAN: He went into the questions of the burner and the price. But he never hinted that he objected to the electric lighting clause; and there was no evidence on the subject.

Mr. MOON: If the Committee have decided the question, of course we should not be entitled to reopen it; but if they have not decided it, then I think we ought to be allowed to discuss it.

The REFEREE: The Committee did decide it.

The CHAIRMAN: There was no opposition to the clause; and the Committee decided that it should stand.

Mr. MOON: Very well, Sir. Then I am quite content to leave it there. I will not ask to be allowed to go into it as a matter of preamble. But we suggest that the clause must be modified; and I do not think there will be any difficulty about what I am going to suggest.

Counsel then conferred with the Agents and Solicitors for the Corporation and the Gas Company.

Mr. BIDDER: My learned friend contends that the words of the clause, as they stand in the Bill, are too general; and that the acquisition by the promoters of the electric lighting installation ought to be subject to their obtaining a Provisional Order. I quite agree with this; and I am prepared to meet my friend by inserting the words he suggests: "If any such Provisional Order is obtained."

Mr. PRITT then brought up the agreed amendments, which, among other things, limited to gas the powers of the Company to take land, and also the power to take land compulsorily for the purpose of roads. A further provision was also inserted, giving consumers of gas up to 2 million cubic feet the benefit of 15 per cent. discount.

The clauses having been formally sanctioned by the Committee, the Bill was ordered to be reported.

Wednesday, June 6.

AMBLESIDE DISTRICT GAS AND WATER BILL.

The Committee commenced to-day the consideration of the Bill by which the Ambleside District Gas and Water Company seek to be incorporated as a statutory undertaking, and apply for power to raise additional capital.

Mr. BIDDER, Q.C., and Mr. RICKARDS appeared for the promoters the sole opponents—the Ambleside Local Board—being represented by Mr. BALFOUR BROWNE, Q.C., and Mr. J. D. FITZGERALD.

Mr. BIDDER, in opening the case, said the Ambleside Gas and Water Company sought incorporation at the hands of the Committee, owing to the disadvantages which attended their being merely a limited Company without statutory powers under the Water-Works Clauses Act to inspect fittings, with a view to preventing extravagant waste, and matters of that description. Under these circumstances, the Company were of opinion that the time had arrived when they ought to submit their case to Parliament, more particularly as certain new works required to be executed for combined gas and water supply purposes, for which Parliament was now asked to give the Company authority to raise further capital to the amount of £9000. The illuminating power of the gas was a subject which would have to be discussed; but this was usually a matter of clauses. With regard to price, the Committee must bear in mind that coal was not so cheap at Ambleside as it was, for instance, at Preston—the place which they had had to deal with in the preceding Bill. It was hoped that the Bill would not have been opposed, except upon clauses; but the Ambleside Local Board had thought fit to present a petition against it, in which they recapitulated certain negotiations which had taken place in the past between the Company and themselves as to the purchase of the works. This the learned Counsel characterized as the most flagrant breach of faith he had ever known in the course of his parliamentary experience. In placing before the Committee, by means of a petition, private correspondence which had taken place "without prejudice," the Local Board were certainly guilty of a breach of confidence. The Company had no wish to be bought out, as they were conducting their business satisfactorily to themselves, and, he believed, to their customers. At the same time, if the Local Board were really in earnest in their desire to acquire the undertaking, he did not think that a private company in the position of his clients ought to offer any obstinate resistance to the proposal. Therefore if, after hearing the case, it appeared to the Committee that a clause should be inserted in the Bill providing for the future acquisition of the concern by the Local Board, he would not, on behalf of the Company, offer any strenuous opposition, but would agree that the way should be kept open by the insertion of the usual suspensory clause extending over a reasonable period—say, twelve months—within which the Board should have the right to give notice of their intention to purchase the undertaking at a certain price, which, if not settled between the parties themselves, would, of course, be referred to arbitration.

The following evidence was then given:—

Mr. *F. M. Taylor Jones*, J.P., a land and estate agent, a member of the Westmoreland County Council, and the Chairman of the Ambleside Local Board, examined by Mr. BIDDER, said he was one of the original promoters of the Company, which was incorporated in the year 1866. They started with a nominal capital of £8000, which was all paid up and expended upon works. Since then further capital had been subscribed, which was also all paid; and a sum of £600 had been recently

borrowed upon mortgage. The Company had a lease for 99 years of the site of their water intake; and there was an abundant supply of excellent water obtainable at a very small cost. The business of the Company had been gradually developed; and they paid a dividend of 11½ per cent. last year. Under an agreement between the Company and the Local Authority, all water necessary for sanitary purposes was furnished at a cost of £4 a year. This included water for fire purposes; and the Company supplied 37 hydrants, for each of which the Local Board paid a rent of 2s. 6d. a year. As regards the gas supply, coal was rather expensive in Ambleside, as it cost 3s. 4d. per ton to cart from the railway station at Windermere. The Company were now paying 18s.; and during the coal strike they paid as much as 23s. 4d. The price originally charged for gas was 7s. per 1000 cubic feet. The present prices were 5s. 8d. under 10,000 cubic feet, 5s. 4d. between 10,000 and 30,000 cubic feet, and 5s. above this quantity, subject to discount of 5 per cent. The price for gas used for cooking and heating purposes had been reduced to 4s. 2d. per 1000 cubic feet; and that employed for lighting the public lamps was supplied at 5s. The charge for water was 9d. in the pound upon the gross estimated rental of the premises; and there was no charge for baths or water-closets unless there was more than one closet in a house. It would be necessary, in the immediate future, to face certain capital expenditure to meet the increased demand connected with the gas and water works—among other things, it was proposed to acquire the freehold of the land upon which the water intake was situated. In his opinion, £9000 was a fair sum to ask for. It was quite true that the Company had been approached by the Local Board upon two occasions, with a view to the purchase of the undertaking; but the negotiations had come to nothing. While the Company were not anxious to sell, if the Committee thought it desirable to leave an opening for the acquisition of the undertaking by the Board, the Company were prepared to agree to the insertion in the Bill of a provision to that effect, and also postponing for twelve months the exercise of the powers for the compulsory purchase of land and the raising of further capital.

Mr. FITZGERALD was proceeding to cross-examine the witness upon the negotiations which had taken place between the Corporation and the Local Board, when

Mr. BIDDER objected.

The CHAIRMAN decided that, as the negotiations were clearly without prejudice, Mr. Fitzgerald was not entitled to cross-examine the witness upon them.

Mr. BIDDER: The Local Board suggest in their petition that they can raise the capital cheaper than we can; and therefore I say to my learned friend that I am perfectly prepared to agree to a clause suspending for a year the power of raising or laying out new capital or purchasing land, so as to enable the Board to buy if they desire.

Mr. FITZGERALD: We contend that the mere fact of obtaining statutory powers would add to the purchase price of the undertaking a value varying from four to six years. That being so, the Local Board object to the worth of the property of a limited liability Company being enhanced and exaggerated in such a way that they might find themselves met by a claim for a higher price for the purchase of the undertaking.

Mr. BIDDER: My friend must remember that the statutory powers applied for are necessary for the ordinary conduct of the business of the Company.

In further cross-examination by Mr. FITZGERALD, witness said he believed the present illuminating power of the Company's gas was not less than 16 candles. It was true that, in the course of a speech recently made by him, he had said that the Company were making 19-candle gas. It varied with the description of coal used.

Mr. FITZGERALD: Have you not been using a certain proportion of cannel—one-sixth or something like that?

Witness: I cannot say what the proportion is.

You have been supplying between 18 and 19 candle gas; and, under the Bill, you propose to send out 15-candle gas?—As a minimum.

Of course, you know it is much less expensive to make 15-candle than 19-candle gas?—I presume it is.

Then, in contrasting your present price with that in the Bill, you have to take into account that you are going to supply gas of between 3 and 4 candles lower illuminating power than you are at present furnishing?—Not so much as that, I think.

Cross-examination continued: It was intended to extend the existing gas-works on the present site, from which it was necessary to supply gas at a very high pressure, in order to force it up into the higher portions of the district. With regard to the water supply, he believed that nearly the whole of the town was served from the present reservoir, as well as most of the houses outside, with the exception of those which had their own wells. It did not necessarily follow that the Company proposed to levy under the Bill a very much higher water-rent, as the charges specified were the maximum. He admitted that, in the Bill, the Company had not allocated a certain amount of capital to water, and a certain amount to gas purposes.

Mr. RICKARDS: There is no objection to doing so.

Mr. FITZGERALD (to witness): Is not the whole question between us and you whether you are to be sold as you now are, or whether four or five years' additional purchasing value is to be added to the value of your undertaking by the passing of this Bill?

Witness: We claim to be entitled to a fair price for the works.

Mr. FITZGERALD: Both parties are agreed upon that; but we say the fair value of them as they now are, whereas you say the fair value after an additional and fictitious value has been added by this Bill.

Re-examined by Mr. RICKARDS: He would not object to submit the question to arbitration under the Lands Clauses Act. Under the Bill, it was proposed to pay 10 per cent. upon the existing capital, and 7 per cent. upon the new capital—about the usual percentage; and then, as soon as the full statutory dividend was reached, the price charged to the consumer would be reduced. The proportions in which it was proposed to allocate the capital were £6000 for gas, and £3000 for water.

Mr. *J. Hepworth*, M.Inst.C.E., said he considered it would be fair and reasonable, both to the Company and to the consumers, that the Bill should become law. The Company's present site was an excellent one for the manufacture of gas; and it was proposed to purchase a small strip of adjoining land, upon which they would be able to carry out an extension of their works, which would be sufficient for the next 15 years. The retorts were capable of producing 75,000 cubic feet of gas per diem. The plant and apparatus were in excellent condition. The condensers and scrubbers required extension; and the Company would shortly have to put up additional gasholders. In consequence of the district being a straggling one, at a considerable elevation, the expense of distributing gas was great; and this necessitated the charging of a high price. The consumption of gas per mile of main was less than a million cubic feet per annum, as compared with an average of 4½ millions throughout the country. During the past ten years, there had been an increase of 70 per cent. in the make of gas; and the quantity sold had been augmenting at a much greater rate. In 1891, it was 5,211,000 cubic feet; in 1892, it was 5,695,200 feet; and in 1893, it was 6,280,300 feet—being an annual increase of 10½ per cent. The gas unaccounted for was not an uncommon amount in a place situated at such an elevation as Ambleside. The leakage last year was 13·61 per cent. As to the expenditure of capital, the amount laid out by the Company per million cubic feet of gas sold in 1884 was £1343; in 1889, it had been reduced to £1229; and in 1893, it was still further lowered to £1114. This was owing to the economical administration of the Company, and to the development of their business. To his mind, it was reasonable to come to Parliament for £6000 additional capital for gas purposes, as the whole of that money would be required within 10 or 12 years, owing to the rapid increase in the consumption of gas; and the works constructed by that time would be all that would be necessary for the next 14 or 15 years. The illuminating power of the gas was fixed by the Bill at 15 candles. This was the usual standard fixed in Acts of Parliament; and it was as high as could be obtained with the best ordinary coal. He allowed £650 of increased capital for each million cubic feet of gas increase of supply, or about half the present expenditure.

Mr. *T. Newbigging*, M.Inst.C.E., corroborated the previous witness's evidence. He said it was in the interest of the consumers as well as of the Company that statutory powers should be granted to them. The Company could not carry on their business in a satisfactory manner without further capital and without statutory powers.

Cross-examined by Mr. BALFOUR BROWNE: The object of the Bill was to obtain statutory powers.

Mr. BALFOUR BROWNE: And statutory powers mean five years' more purchase at least?

Witness: It means a few more years' purchase. I will not commit myself to three or five years; but, whatever it is, that is not the main object of the Bill, which is to enable the Company to fulfil the requirements necessary for the supply of the district.

As the Company have conducted their business in such an exemplary manner for about 30 years, I presume they could go on in the same exemplary manner without statutory powers?—I do not think so.

If I could put down a sufficient price, I suppose you would be quite willing to go away without this Bill?—Personally, I should prefer to keep the works in the hands of the Company. At the same time, I believe the Directors would have no objection to sell the works, leaving the question of price to be settled upon arbitration terms. If the passing of the Bill resulted in an enhanced price, so much the better for the Company; and I do not believe it would be much worse for the people in the district.

Mr. *G. F. Deacon*, M.Inst.C.E., in reply to Mr. RICKARDS, said he had examined the existing water-works of the Company, and had come to the conclusion that the pressure was sufficiently great to raise the water to any house he saw in the district. The drainage area was 1510 acres; and the supply from this area was abundantly sufficient, even in the driest season and without storeage, for the wants of a much larger population than Ambleside now possessed. The mean elevation of the drainage area above the point of interception was rather more than 955 feet; and the mean distance from that point was very small indeed. Consequently, any water passing into the streams was stored and given out to a very much larger extent in dry weather than if it went up to the same height at a greater distance. The water was conveyed from the intake by a 9-inch pipe, 300 yards in length, to the reservoir, the level of which was 480 feet above the sea, 302 feet above the lake, and about 200 feet above the mean level of the town. The length of the main from the reservoir to the centre of Ambleside was 1300 yards; and the 9-inch pipe was capable of supplying a population three or four times as large as the present. Owing, however, to the absence of the power of inspection, the private fittings and service-pipes were in a most unsatisfactory condition. It was a very serious thing that the Company had not any authority to require the repair of private fittings; and it would be fatal in the case of almost every other water-works. Fortunately, there happened to be a very abundant supply in this case, as there was a visible leakage, in addition to the hidden leakage, amounting to a great many gallons per head per day. If the Company were empowered to enforce the use of proper fittings, a great deal of this leakage would be preventible. In answer to further questions, witness expressed the opinion that the rates proposed to be charged under the Bill were fair. They were, in fact, less than the average throughout the country.

Cross-examined by Mr. BALFOUR BROWNE: In the hands of a local authority, small house property certainly had the advantage of lower rates; but, under the Water-Works Clauses Act, as soon as a company reached their maximum statutory dividend, they would have to reduce their price. At present they could charge what they pleased.

Mr. *T. Mackereth*, the Secretary and Manager of the Company, stated that £7437 had been expended since 1866 in respect of gas, and £4928 in respect of water. The Company's dividends had fluctuated from 4 to 9 per cent.; and the price of gas, from 8s. 4d. to 5s.

Cross-examined by Mr. FITZGERALD: A sum of £12,365 had been spent on works; leaving £235 of working capital unexpended, in addition to the reserve fund of £600.

Thursday, May 7.

The consideration of the Bill was continued to-day.

Mr. *J. Fleming*, examined by Mr. RICKARDS, said he was an architect and surveyor, and was the Sanitary Officer and Surveyor

to the Kendal Union Rural Sanitary Authority until the formation of the Ambleside Local Board. He had carried on his profession in Ambleside since 1866, the date of the formation of the Gas and Water Company, of which he was one of the original shareholders. Ambleside was then constituted a special drainage district under its own Sanitary Authority. Prior to that time, there were no public sewers or drains; nor was there any public water supply. Wells had occasionally to be closed on account of pollution, until the Company furnished a public water supply. He had personally superintended the work of constructing the sewers under the authority of the Local Board; and it was a matter of common knowledge that the sanitary condition of Ambleside was very much improved by the simultaneous provision of the sewers and the water-works in 1866-7. During the time he was Sanitary Inspector and Surveyor, he never heard of any complaints as to the quantity or quality of the water supplied. The sewage was chemically treated with lime in subsiding-tanks, from which it passed into the river, and so into the lake. About 2¾ miles of the sewers were flushed by the Company's water, which during his time was never stinted.

Mr. RICKARDS: There was a little mistake made yesterday about the reserve fund, which it was stated amounted to between £600 and £700. (To witness:) As a matter of fact, is that fund at the bank?

Witness: No.

Is it an available asset?—No; it is in the works.

It is really represented by stock-in-trade which can be realized?—Practically.

Mr. RICKARDS: That, Sir, is the case for the promoters. We have very carefully considered the remarks that fell from you with regard to free baths and free water-closets, and also as to our proposed charges. We are very anxious to meet the views of the Committee; and we have decided that, in the case of all houses up to £20 rateable value, we will supply one bath and one closet free. We further propose to reduce the scale of charges in the Bill in respect of houses of all the different values to the extent of 25 per cent. This would give the following figures: At present the actual charge on a £5 house is 5s. Under the Bill, we should have a maximum charge of 6s. 6d. In the case of a £10 house, the present charge is 7s. 6d.; and we now propose to charge 10s. 2d., bearing in mind that we are going to supply a bath free.

Mr. BALFOUR BROWNE: We have that already.

Mr. RICKARDS: I am quite aware of that.

The CHAIRMAN: Then it is not exactly a concession.

Mr. RICKARDS: We have the power of charging for it now; so that it is a considerable concession. Then in the case of a £20 house, the actual charge at present is 15s.; and we propose to fix the maximum at 19s. 2d. In the case of a £20 house, we now charge £1 2s. 6d.; and we propose to put the maximum possible charge at £1 8s. 9d. In the case of a £40 house, the actual charge is £1 10s.; and we propose to fix the maximum at £1 15s. 8d. Then with regard to gas, we propose to reduce the price from 6s. 8d. to 6s. per 1000 cubic feet.

The REFEREE (to witness): Why was this Bill promoted?

Witness: Because of the difficulty we have found in stopping the great leakage of our water. We have never thought of cutting off any of the leaking pipes; and the only remedy we could see was to apply to Parliament for power to examine the fittings, which we have no authority to do at present.

How have the Company served the district in the past, in the matter of water and gas supply?—Very well indeed.

The CHAIRMAN: Can you now answer the question which I asked yesterday, as to the unused borrowing powers?

Mr. RICKARDS: We have power to borrow not exceeding the amount of our share capital.

Mr. BALFOUR BROWNE: Then that will be £11,000.

The REFEREE (to witness): Has it never occurred to you to cut off the supply of water where the appliances were defective?

Witness: No.

You have power to do so, of course?—Yes.

The room was then cleared; and the Committee deliberated in private for some time. Upon the re-admission of the parties,

The CHAIRMAN said the decision of the Committee was that the promoters had not proved their case—that the preamble of the Bill was not proved.

Mr. BALFOUR BROWNE: May I be allowed to say one word? My learned friend Mr. Bidder yesterday made some remarks about a breach of good faith. I desire, in the strongest possible way, to repudiate that. You will remember he said this: "I say it advisedly, that it is one of the most scandalous and flagrant breaches of faith that I ever knew in the whole course of my parliamentary experience." That is not true. I will tell you exactly what occurred. The Company wrote to the Clerk to the Local Board, who are my clients, "without prejudice;" and they must have known, unless they were exceptionally silly, that he must communicate the contents of the letter to the Board, whose proceedings are public and are reported in the newspapers. Consequently, when this petition was drafted by Mr. Pritt, who is one of the most scrupulous Parliamentary Agents, the correspondence was embodied in it. Therefore I say, without hesitation, that there was no breach of faith. We should certainly never have used the letters if the matter had gone to arbitration; and we will not do so now, if the matter should ever come before an arbitrator.

Mr. RICKARDS: I do not wish to make any personal imputation against the Clerk of the Local Board; and, I was going to say, much less do I make any against Mr. Pritt. But we did consider that when we came before the Committee we ought to have been exactly in the same position, in reference to this matter, as we were before the negotiations took place, as the Committee might possibly have inserted terms of purchase in the Bill.

The CHAIRMAN: We were careful to protect you. It seems evident to us that, negotiations may go on, and that the Local Board may hereafter purchase the undertaking of the Company. I do not know whether or not it might be to the advantage of the promoters that the Bill should be allowed to proceed with a suspensory clause in it, as you asked.

Mr. BALFOUR BROWNE: I think, on the whole, the decision of the Committee that the Bill should not proceed is the better one; and I will tell you why. In any event, we should have to come to Parliament for an Act or for a Provisional Order; and the terms will be settled then. I say distinctly, so far as my clients are concerned, that we are prepared to go on with the negotiations.

Mr. RICKARDS: With regard to the position of the Local Board, as Mr. Bidder told you in opening, we should be prepared to come to any fair arrangement with regard to the insertion of a suspensory clause. If the matter is in any way still open, I should urge very strongly that the Committee should give us an opportunity of bringing up the Bill with a suspensory clause such as Mr. Bidder outlined.

Mr. BALFOUR BROWNE: I must object to that.

The CHAIRMAN: Of course, the Committee have given their decision.

Mr. RICKARDS: Then I must bow to it.

The proceedings of the Committee, which had extended over six weeks, and included the consideration of the principal opposed Gas Bills of the session, then closed.

HOUSE OF COMMONS COMMITTEE.

(*Before Mr.* JACKSON, *Chairman; Mr.* H. F. PEASE, *Mr.* PAULTON, *and Mr.* ROUND.)

Monday, May 28.

THAMES CONSERVANCY BILL.

On the resumption of the proceedings to-day,

Mr. *Gough* continued his evidence under the examination of Mr. BAGGALLAY. He said that the West Middlesex Company first carried their intake above Teddington Lock under an Act of 1852, which did not impose any limit upon them as to the quantity of water they might take. In 1886, the Company went to Parliament to extend their limits of supply, when the Conservancy intervened, asking Parliament to insert a clause confirming the limit of 20 million gallons a day fixed in the agreement of 1852 between the Company and the Corporation in respect of which the Company paid £300 a year. The Conservators then consented to the Company taking an additional 4½ million gallons; their contribution being raised to £1000 a year. In 1867, the East London Company applied to Parliament for powers to take water from the neighbourhood of Sunbury Lock, when the Conservators again intervened; and a clause was inserted restricting the amount to be taken by the Company, except in times of flood, to 10 million gallons per day. But there was no agreement with the Conservators as to how much was to be taken. The quantities to be abstracted by the Companies, therefore, were as follows: Chelsea, by their Act of 1875, 20 millions; and by the agreement of 1886, 2 millions—total, 22 millions. Grand Junction, by the agreement of 1852, 20 millions; and by the agreements of 1886, 4½ millions—total, 24½ millions. Lambeth, under the agreements of 1848 and 1851, 20 millions; under the agreement of 1886, 4½ millions—total, 24½ millions. Southwark and Vauxhall, under the agreement of 1852, 20 millions; under the agreement of 1886, 4½ millions—total, 24½ millions. West Middlesex, under their Act of Parliament, 20 millions; by the agreement of 1886, 4½ millions—total, 24½ millions. East London, under their Act of 1867, 10 millions. The grand total was 130 million gallons. The South-West Suburban Company were entitled, under their Act of 1887, to draw an unlimited quantity from the gravel adjoining the Thames; but they had entered into an agreement with the Conservators to take 1 million gallons daily from the river itself, paying a contribution of £115 a year. The West Surrey Company, under their Acts of 1869 and 1880, were limited to 3 million gallons a day, for which they were liable to pay £50 per half million gallons. The Oxford Corporation had power to take whatever could be carried by a 24-inch pipe; the amount being calculated at about 5½ million gallons. The Windsor Corporation had unlimited powers; but, as a matter of fact, they took something like 3 million gallons. Then with regard to the payments by the Water Companies, the Chelsea Company paid £2800, and it was proposed to increase it to £4800; the Grand Junction, £3300, which would be increased to £5500; the Lambeth Company, £3250, to be increased to £5450; the Southwark and Vauxhall, £3300, to be increased to £5500; the West Middlesex, £3300, to be increased to £5500; the East London, £2000, to be increased to £3000; and contributions of the South-West Suburban and West Surrey Companies were to be augmented by £100 per annum each. This would give an increased contribution from the Companies of £12,500. Witness proceeded to give details of legislation with reference to the Conservancy as it affected the Water Companies; and he went on to say that since 1866 the Conservators had spent £138,700 out of revenue, and £177,500 from capital upon locks, weirs, dredging, towing-paths, plant, banks, and bridges on the Upper Navigation.

Mr. BAGGALLAY: You would not, of course, suggest that all this expenditure would be directly for the benefit of the Water Companies; but is it a fact that a very large portion of it had, directly or indirectly, inured to the benefit of the Companies?

Witness said certainly. They had been enabled by these works to equalize and regulate the flow of the river; and every reach between the weirs was made a subsiding tank or reservoir. The Conservators had also provided for the benefit of the Water Companies the form of tumbling-bays at the weirs; and these produced better aëration of the water. The provisions for the prevention of pollution were essentially intended for the purifying of the water for the purposes of supply. It was very necessary, in order to efficiently carry out their powers with regard to the prevention of pollution that the staff should be increased. At present they had a Chief Inspector upon the river above Staines, with an Assistant-Inspector and two River Inspectors under each; the expenses of the staff being £1040, half of which he thought might fairly be allocated to the prevention of pollution. Below Staines and the western limit of the Metropolis, two officers did the whole work, at a cost of £340. At the head office, there was a purification department; the salaries amounting to about £500 per annum, without any charge being made for the Secretary, Engineer, and general office staff and expenses. The cost of analyses

was about £400 a year; and the legal and parliamentary expenses might be estimated at £200 a year in connection with the prevention of pollution. The total cost fairly referable to purification was £1980 per annum. If the extended powers of the Bill were granted, the Conservators proposed to divide the river into twelve districts, each with an inspector and a subordinate. Over them there should be a Chief Inspector, who should be an Engineer conversant with sewage and water questions, more especially to see to the management of sewage works—a point to which the Royal Commission on Water Supply attached considerable importance. They also proposed to appoint, for analytical purposes, a Chemist of standing, who would carry weight in proceedings taken in Courts of Summary Jurisdiction against offenders in regard to pollution. He calculated the cost of this staff as follows: Chief Inspector, £700 per annum; Chemist, £700; twelve inspectors, at £250 each; and twelve subordinates, at £80 each—making altogether £4460. The expenses of the staff, apart from salaries, he reckoned at an additional £2364, or a total of more than £7000. Altogether, he estimated the cost of the Board with regard to purification, excluding office expenses, would be £10,500 a year. At present the total up-river income, including the £16,635 paid by the Water Companies, was about £23,665; and with the additional payments by the Water Companies, it would be increased to about £35,000. The future expenditure for works he estimated at £12,000 a year; the fixed charges at £12,000; and the additional charges proposed to be incurred in regard to pollution would bring it up to £33,000. They calculated that the increased contributions from the Companies represented to the Chelsea Company 11s. 11d. per million gallons; to the East London Company, 16s. 5d.; the Grand Junction Company, 12s. 3d.; the Lambeth Company, 12s. 2d.; the Southwark and Vauxhall Company, 12s. 3d.; and the West Middlesex Company, 12s. 3d.—varying from 1-5th to 1-7th of a penny per 1000 gallons.

Mr. PEMBER, in cross-examining the witness for the Associated Water Companies, called his attention to article 3 of the agreements between the Conservators and the Companies, which, he said, were all in the same form: "In the event of the Company introducing into Parliament a Bill seeking power to take, divert, and impound, in any 24 hours from midnight to midnight, any quantity of water not exceeding in the whole the quantity hereinbefore mentioned in respect of the Company, the Conservators will in every way, and, if necessary, by evidence to be given at the expense of the Company, support the application, and will not seek, in respect of any such quantity, any further payment or compensation whatever." He asked witness whether, under the Bill, the Conservancy proposed to give the Companies any more water than they might take under the agreements.

Witness said they did not.

Then how do you reconcile the demand for £10,000 a year more from the Companies with that stipulation?—The circumstances have materially altered since then; the Royal Commission having recommended that the area of jurisdiction of the Conservators with regard to pollution should be largely extended, and that the expense should be borne by the Water Companies. The Commission also recommended that the Companies should be allowed to take water up to 300 million gallons; but the Conservancy did not embody this proposal in the Bill. Supposing the London County Council were to succeed in their contention that the agreements of 1886 were invalid, the Bill does not make any provision for the cessor of the Companies' payments.

But when you have paid a certain amount of money for a certain article, and a proportion of that article is taken away from you, do you think it is fair that you should not only pay as much as you had paid in the first instance, but about 30 per cent. besides?—On the surface, I do not think it appears fair; but, considering what the Water Companies get, I think it is not unfair.

The supply from the Thames might cease altogether; and we should still have to pay the £30,000 a year?—I should hardly think that this could be done without a Bill being brought before Parliament. The water could not be taken away from the Companies.

In further cross-examination, witness said that, out of the £315,000 expended by the Conservators in works, it was impossible to ear-mark any part which was solely ascribable to the necessities of the Companies; but he should think more than half of it would be for their benefit. The whole of it, he considered, was to the advantage of the Companies; but other people also derived benefit from it. The amount received from the Companies more than covered the expenditure to which he had referred.

Cross-examined by Mr. POPE for the Southwark and Vauxhall Water Company, witness stated that he could not refer to any previous Bill of the Conservancy which in any way dealt with the quantity of water to be taken from the river. Hitherto this question had been dealt with by Parliament, generally in Bills promoted by the Water Companies themselves, supplemented by agreements between the Conservators and the Companies.

Mr. POPE: What is the special reason, if any, why the Conservators should now seek to introduce any provision on the subject?

Witness: The Conservancy consider the quantity of water taken under the agreements—130 million gallons—is as large as should be drawn from the river; and they felt that it is desirable that it should be made a statutable quantity.

Did they consider the fact that the Royal Commission had certainly established two things—viz., that the quality of the water supply was good; and that, with the addition of storeage reservoirs, to be supplied either by a Water Authority or by the Water Companies—300 million gallons was sure to be obtained?—The question of storeage reservoirs would be one that would have to be dealt with by Parliament hereafter, under a Bill which would have to be introduced.

Cross-examined by Mr. COHEN as to the effect of the Bill giving validity to the agreements, witness said he did not think it would give them more validity than they had at present. He considered it was a perfectly fair thing to give the Companies the quantity of water prescribed in the schedule, which was the amount they were now able to take under the agreements.

In the course of witness's re-examination by Mr. BIDDER, the question arose as to the effect of the instruction of the House on the question of forbidding the taking of additional water from the Thames, and the legalizing of the present agreements.

Mr. POPE said that, supposing the London County Council were to establish the invalidity of the agreements, the effect would be to throw the Companies back upon such other powers as they had. The clause in the Bill would act rather in restriction of the legal position of the Companies. He did not see why it was necessary to legislate at all. If they did not legislate, they could not confer increased powers.

Mr. BIDDER said this was perfectly right. Supposing there was anything in the contention of the County Council, and a judgment of the Court was obtained that the agreements were invalid, then they were thrown back upon such other powers as they had. It was the contention of some of the Companies that they would have an unlimited right of taking water from the Thames. The Conservators' position was this: They had entered into agreements which they had never repudiated or attempted to repudiate. The clause was framed by them so that, even if the County Council's contention were true, the Companies should be held to the quantities to which they had agreed to restrict themselves.

Mr. RICKARDS explained that his view of the position was that, if the County Council upset the agreements of 1886, the Companies would be relegated to the original agreement of 1852. They would thus be deprived of the power to take the additional 4½ millions, and would be obliged to pay a great deal more money for less water.

Mr. POPE said there was no doubt that the purport of all the agreements was to limit the quantity the Companies might take under their statutory powers; and that any contention by which the County Council upset the agreements of 1886 would be equally fatal to the agreements of 1852, and they would thus be thrown back upon their statutory powers.

Mr. BIDDER urged that the discussion had shown how dangerous it would be to leave things as they are, in view of the possible invalidation of the agreements; and he said that the only desire of the Conservators was to fix the Companies to the quantities to which they were restricted by the agreements.

The Committee then adjourned till the following day.

Extensions at the Rugeley Water Works.—Contracts have been let by the Rugeley Local Board for the construction of a brick service reservoir and the laying of pipes at a cost of £2421, and for the supply of cast-iron pipes at £2137.

Sales of Stock and Shares.—Messrs. Joel and Son, of Newcastle, last Tuesday offered for sale, in lots of £100 each, £75,000 of the *Newcastle and Gateshead Water Company's* 5 per cent. preference stock, 1889; and, in less than an hour, the whole was disposed of at from £151 to £152 per cent.——On the same day, Messrs. Hollis and Webb, of Leeds, sold, among other investments, some fully-paid £5 shares in the *Thirsk District Water Company* at 20s. each, and £100 of 7½ per cent. "B" stock in the *Harrogate Gas Company*, at £277.——Five "A" shares in the *Camborne Water Company* lately changed hands at £22 each; and a similar number of "B" shares at £15 2s. 6d. apiece.

The Market for Gas Oil.—At the annual general meeting of the Pumpherston Oil Company recently held in Glasgow, the Chairman (Mr. J. Wood, of Bathgate), referring to the market position of gas oil, stated that it continued to improve. The new outlet for the enrichment of coal gas had created, and was rapidly developing, a demand for gas oil, which must in the near future freely absorb the production of this oil, which for many years had been a drug in the market. To meet the increased demand, oils which had hitherto been used in other ways could be made available for enrichment; and thus effect the double purpose of meeting the demand for gas oil, and diminishing the production of other oils which were in less demand.

Denton and Haughton Gas Supply.—According to the report of the Engineer and Manager of the Denton and Haughton Local Board Gas-Works (Mr. J. Chadwick Smith), the past financial year was by no means an unsatisfactory one. The balance on the revenue account was £4741; and the net profit, £1231. The quantity of gas sold was 60,892,821 cubic feet, as compared with 60,337,458 cubic feet in 1892-3; the gross profit per 1000 cubic feet for the two periods being 1s. 2·45d. for the former and 1s. 0·69d. for the latter. An interesting feature of the accounts is the low price paid for coal—9s. 8·09d. per ton, as compared with 10s. 4·44d. in 1892-3. Mr. Smith was fortunately able to pass through the coal crisis without requiring an addition to his stock; and at its close he found himself with a month's supply on hand. Though his leakage is about 2·6 per cent. higher than before, Mr. Smith makes, on the whole, a good showing; and the Gas Committee have testified their appreciation of his services by increasing his salary by £30 per annum.

West Bromwich Corporation Gas Supply.—At the meeting of the West Bromwich Town Council on Wednesday last, the Mayor (Mr. Alderman Farley), in moving the adoption of the Gas Committee's report and the accounts of the Gas Department for the year ending March 31, to which reference has already been made in the JOURNAL, expressed regret that trade had been so unsatisfactory as to result in a loss of £265. With regard to the coal carbonized, there was, he said, a saving of about £1000; the contracts having been lower than in the previous year. There was a considerable difference in the yield of coke, which was sold at reduced prices, causing them to be £1000 on the wrong side. Against this they had done better with ammoniacal liquor; the market prices having improved. They had written off for the redemption and the extinction of the debt upon the undertaking no less than £2341; so that, after taking everything into consideration, the town was practically £2000 the richer by being the owner of the gas-works, than it otherwise would have been. Though the result was very disappointing, still, having regard to the low prices of gas in West Bromwich, he thought they could congratulate themselves it was no worse. For the first time the accounts, after they had provided for the redemption of loans and corporation stock, showed a deficit. The future prosperity of the undertaking depended very much upon the coal and tar contracts. Unfortunately, there was a probability that they would have to pay higher prices for the coal than last year; and if they had also to sell their tar at a lower price, he was afraid they would have to ask the Council to raise the price of gas. If, however, they could struggle on without doing this, it would give them pleasure; but he wished the Council to be prepared for an increase. The report was approved.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, June 5.

(*Before Mr. Justice* HAWKINS *and a Special Jury.*)

Kipp v. The Newcastle and Gateshead Gas Company.

In this action the plaintiff claimed 2½ per cent. of commission on the purchase price of the tar produced by the defendant Company, on the ground that he had procured a contract for its sale at an advance of 10 per cent. on the price previously paid, and that he had agreed with the Company's Secretary (Mr. W. Hardie) that he should have this commission.

Mr. WADDY, Q.C., and Mr. TEMPERLEY appeared for the plaintiff; Mr. JELF, Q.C., and Mr. WILLES CHITTY, for the Company; and Mr. LAWSON WALTON, Q.C., represented Mr. Hardie, who was also made a defendant on the pleadings, though Mr. Waddy intimated early in the case that he did not ask any damages against him.

It appeared, from plaintiff's evidence, that he was formerly Manager for the late Mr. Hall, who had contracts with the Company to take their tar. After his death, these contracts were continued by Messrs. Hoyle, of the Wear Fuel Company, Sunderland, who succeeded him; and they were to terminate at the end of 1891. In February of that year, the plaintiff called on Mr. Hardie, at the Company's office in Newcastle, and suggested that he could obtain a price 10 per cent. better for the tar; and on returning to London, and consulting Messrs. Burt, Boulton, and Haywood, with cr for whom he was acting (it was not at all clear, on the evidence and correspondence, whether he professed to be acting on his own behalf, or for the firm named), he sent a telegram to Mr. Hardie making an offer. Mr. Hardie replied, saying the Directors had decided to advertise for tenders. This was accordingly done; and, in the result, the former contractors' tender was accepted. After some time, plaintiff wrote asking that his services in the matter might be considered by the Directors; but he did not make a specific claim for 2½ per cent. until this action was commenced last year.

Mr. *T. S. Boulton* having stated that his firm were prepared to give for the tar the price mentioned in the telegram,

Mr. *Hardie* was called as a witness by Mr. WADDY. He said he acted for the Company in ordinary matters of business; but all contracts were made by the Directors. He should refer to the Board a question of commission. They had never paid commission on either the sale or the purchase of any materials. He remembered the interview with the plaintiff on Feb. 3, 1891. He listened to what he had to say, and said he would report the interview to the Directors. This he did. He did not promise the plaintiff a commission of 2½ per cent. His offer was not accepted by the Directors.

While Mr. Hardie was under examination, the jury interposed; saying they were quite satisfied, on the evidence given, that there was no contract for commission.

They accordingly returned a verdict for the defendants.

Justice HAWKINS then entered judgment for defendants, with costs.

COURT OF SESSION.—Thursday, June 7.

(*Before Lord* LOW.)

Milne v. The Police Commissioners of Lockerbie.—The Imposition of a Gas Guarantee Rate.

To-day his Lordship gave judgment in the action brought by Thomas Milne, a grain merchant, and four others, resident in Lockerbie, against the Police Commissioners of the town, to obtain declarator that the defenders, as Commissioners under the Burghs Gas Supply (Scotland) Act, 1876, are bound to fix the price of gas at such a figure as will, as nearly as can be estimated, raise sufficient income to meet all the cost of manufacture and distribution, together with interest on borrowed money; and that it is illegal to impose, as they have done, a gas contingent guarantee rate of 5d. per £1 upon the rates. Reduction was also asked of the resolution of the Commissioners to impose the rate. The Commissioners maintained their right to impose the rate, because, if they were to raise the price of gas so as to bring in an income sufficient to meet all charges, fewer people would use gas; and the undertaking would become unproductive, and would be thrown on the hands of the ratepayers. They therefore maintained, further, that it was in the interest of the ratepayers that the contingent rate should be imposed.

Lord Low, in giving judgment, said: The first question in this case is what is the true construction of the 41st section of the Burghs Gas Supply (Scotland) Act, 1876. Reading that section alone, I do not think it is ambiguous. It makes it imperative upon Gas Commissioners to fix the price to be paid for gas at such a sum as will, as nearly as can be estimated, meet all the charges for manufacture and distribution, and the interest upon money borrowed in respect of the works. *Prima facie*, the defenders have not adhered to the provisions of the section, because they have deliberately and intentionally fixed the price of gas at an amount not capable of raising a sufficient income to pay the interest on the sum they have borrowed, as well as all the other charges specified in the section. The position taken up by the defenders is this: They say that the price they have fixed is that which is calculated to bring in the largest possible income, because, if they made the price higher, many people would not use gas, and the income would fall. They have, they contend, a discretion in the matter; and the words "as nearly as can be estimated" must be read as meaning "as nearly as can be estimated consistently with the prudent and profitable management of the undertaking." This construction, they argue, must be put upon the 41st section when it is read along with the 38th section. When read alone, it does not appear to me that the 41st section gives any discretion to the Commissioners, or that the words "as nearly as can be estimated" admit of the construction for which they contend. It is therefore necessary to consider the terms of the 38th section. That section comes in in a part of the Act—from the 27th to the 40th section, both inclusive—which deals with the borrowing powers of the Commissioners. The 27th section authorizes the Commissioners to borrow on mortgage any money which may be necessary for the erection of gas-works, and to grant mortgages in security of the money so borrowed, and of the interest thereon. Provision is then made, by sections 28 to 37, for the form of the mortgages and interest bonds, for the appointment of a judicial factor in the event of the annuities or interest on borrowed money falling into arrear, for the application of borrowed money, and kindred matters. Then the 38th section provides that "it shall be lawful for the Commissioners, and they are hereby required, from time to time, to fix, impose, and levy such a rate, to be termed the 'gas contingent guarantee rate,' as may be required to pay any annuities and any interest due thereon, and the interest on money borrowed or to be borrowed under the provisions and for the purposes of this Act." The section appears to me to be designed for the security of mortgagees and annuitants, if the price of gas fixed under the 41st section does not produce a sufficient income to meet the interest on borrowed money as well as the other charges. Then, and not till then, the Commissioners are authorized and required to levy a gas contingent guarantee rate. I arrive at this conclusion because, in the first place, the provisions under the 41st section, of the basis on which the price of gas is to be fixed, are imperative; and then, in the second place, the terms of the 38th section as expressed, and the rate thereby authorized described, appear to show that the rate is only to be levied to meet a contingency—the contingency, namely, of the price derived for gas not being sufficient to meet the interest upon borrowed money and other charges. I am therefore of opinion that the defenders, in fixing the price of gas from year to year at an amount lower than would be estimated as required to meet the necessary outlays, acted illegally; and that the pursuers are entitled to decree in terms of the leading conclusions of the summons. I propose to pronounce decree in terms of the first two conclusions, and then appoint the case to be enrolled for further procedure, in order that the parties may consider if it is necessary to go farther; I mean, if the price were once settled, it might be matter of arrangement. I will grant leave to reclaim; and the question of expenses will be reserved.

NORTH LONDON POLICE COURT.—Monday, June 4.

(*Before Mr.* LANE.)

Unlawfully Obtaining a Supply of Gas.

To-day, Mr. *William Culross*, solicitor, of Hornsey Rise Gardens, Crouch Hill, and *Thomas Meadows*, builder, of Highbury Hill, were summoned by The Gaslight and Coke Company for connecting the supply and consuming gas without their consent.

Mr. HUMPHREYS appeared for the Company; and the defendants were unrepresented.

The evidence given by officials of the Company was that on the 26th of September last year the gas supply at 24, Hornsey Rise Gardens, was disconnected, and a cap put on the supply-pipe, together with the usual printed notice, that, under a penalty of 40s. a day, "this cap must not be removed except by the Company's officials, or with the written consent of the Company." On the 14th of February last, an inspector in the service of the Company called at the house, and saw that the gas was connected. The cap was off, and the notice gone.

Mr. *Culross* admitted giving orders for the connection to be made, and also using the gas; but he added that he was under the impression that the gas-fitter employed had given the required notice; and he (Mr. Culross) was surprised at receiving no account. It appeared that the report of the official as to the offence was overlooked by the Company; and on May 10 another official called, and saw that between the removal of the cap and that date 11,600 cubic feet of gas had been consumed.

Mr. *Meadows*, to whom the order for the connection was given, said he entrusted it to Mr. Baynes, a plumber and gas-fitter, and thought he had informed the Company.

Mr. *Baynes* said the workman who made the connection distinctly understood that Mr. Meadows had obtained the necessary consent.

Mr. LANE: You do not suggest fraud in this case?

Mr. HUMPHREYS: No; but it is a very serious offence, punishable by a penalty of 40s. a day.

Mr. LANE fined Mr. Culross 5s., and 2s. costs; and Mr. Meadows 20s., and £2 2s. costs.

The first-named defendant said he would pay all costs.

Portsmouth Water-Works Company.—In the course of his remarks at the half-yearly meeting of this Company on the 24th ult., the Chairman (Mr. W. Grant, J.P.) stated that the water-rental for the six months had increased by £1000, as compared with the corresponding period of last year. The half year, although a prosperous one, had not been marked by any special incident, excepting a motion introduced in the Town Council by Sir William Pink as to the charges of the Company. The matter was referred to a Committee; and a deputation waited upon the Directors and expressed their views. They had, however, previously addressed inquiries to every town in England of 30,000 or more inhabitants. They received information from 53 towns—practically the whole of them. In 40 cases, the water-works were the property of the Corporation; and no comparison could be drawn with any degree of justice between the charges made in these towns and in those where the works belonged to a private company, because a corporation possessed the right of supplementing the water-rate by a charge upon the general rates. Dealing with the remaining thirteen cases, they found, on looking into the figures, that the charges of the Portsmouth Company for water by meter were just about the average; and for domestic supply the charges were the very lowest of the thirteen towns. These facts had been communicated to the Town Clerk; and he thought the outcome of the investigation was as satisfactory as it was conclusive. The Directors' report was adopted.

MISCELLANEOUS NEWS.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, 60, Gracechurch Street, E.C.—Mr. J. Birch Paddon in the chair.

The Secretary (Mr. A. W. Cooper) read the notice convening the meeting; and the report and accounts for the year ending March 31 last (see *ante*, p. 976) were then submitted.

The Chairman said that the leading features of English gas companies' accounts for the last six months were the effects of the coal strike and of commercial depression. Unlike these companies, they had not been affected by coal strikes either prejudicially or advantageously; but they had certainly felt a full share of the commercial depression. Dealing with the accounts, he said that no addition had been made to the share capital nor to the debentures—indeed, the debenture capital was a shade less (£150); but, on the other side of the accounts, they had an expenditure of £891. This sum was chiefly made up of that portion of the cost of the main between Valetta and Calcara which fell into this year's accounts. He might here say that this main was not only a profitable undertaking, but it promised to be more so—in point of fact, the districts that were served by it had shown, for the last ten years, a steady rate of increase to the extent of something like 4 per cent. The only other item in the balance-sheet to which he need refer was the reserve account, which now reached £16,000, including the contribution from this year. The accounts showed that the whole of this had been expended in the extension of the works from time to time, and in the reduction of the debenture capital. Since they commenced to make these allocations from profits in 1877, the annual quantity of gas sold had more than doubled; the works too, both in capability and structural value, had more than doubled; and still the capital was no greater than it was in 1877—in fact, it was less by £2354. He thought the shareholders would admit that this was by no means a bad record. If they were to call up this £16,000 from capital, and invest it separately as a reserve fund, it would be a perfectly sound financial proceeding. He hoped this would be done some day; but, at the present time, they were hardly strong enough for an operation of that kind. Coming to the profit and loss account, the item of coal was £1226 less than in the preceding year; the price per ton was lower by 1s. 7½d.; and they had used about 150 tons less. Salaries and wages were £288 more, which was attributable partly to wages and partly to well-earned additions to existing salaries. Maintenance had also increased by £566, which was chiefly on account of works and mains at Marsala, where they had had to make some extensions. The item of bad debts and allowances was clear evidence of successful management with regard to the rental account. They had, as a matter of fact, paid into their bankers £35,000, and had had the almost inappreciable loss of £27. He thought this was a very notable incident, as, when the revenue was only half what it was now, the loss was £300 or £400. The item of exchange was rather more than in the previous year (about £34). But the rates were practically the same; and if there was any satisfaction at all about them, it was that they could not very well go much higher. The first item on the other side of the account—the sale of gas—raised the question of working. He found that the coal used amounted to 12,175 tons; and the average cost was 16s. 4·79d. per ton. The gas produced from the quantity named was 125 million cubic feet, which was at the rate of 10,270 feet per ton. The gas sold was 112 million cubic feet; and this was at the rate of 9196 feet per ton. This left 13 millions unaccounted for, which was equal to 10·46 per cent. This might sound rather large; but the shareholders must remember that it was from the working of five different sets of mains, some of which were long and small. It also included the whole of the gas used upon the works and in the offices, besides the consumption in some large lamps at Malta and Corfu which were put up some time ago, and which the Directors considered it politic to allow to remain for the present. The gas-rental (£28,263) was less by £445—a decrease of about 1½ per cent. As a set-off against this, however, they had an increase on coke, tar, and fittings of £217; so that the income had not been much affected. Regarding the next item, "The late Manager's life policy, £615 12s.," the Chairman explained that some years ago this became the property of the Company; and the Directors considered it desirable that they should continue to pay the annual premiums. The policy had now been realized; and the proceeds had been very properly carried to the revenue account, inasmuch as the whole of the payments came from that source. The profit on the year's working was £11,166. In Malta the commercial depression had been severely felt. The prosperity of the port of Valetta was very largely dependent upon the shipping; and as, during seven months out of the past twelve, strict quarantine regulations had existed, the number of ships calling at the port was far less than usual. The reduction in the gas-rental at Malta was £553, which was rather more than the total decrease which appeared in the accounts, because it had been made up at some of the other stations. The whole of this decrease was due to certain reductions that had been made in the price, and not to a diminution in the sale of gas; for they had sold more gas in Malta than during the previous year. They had fixed 150 new meters in the year, which meant a corresponding number of new consumers; they had practically doubled the number of gas-stoves; and they were now under contract with the Naval authorities to supply gas for five years. These various additions had caused disappointment at the decrease he had mentioned to disappear. Then with reference to the electric light, he regretted to say that the efforts of the Chief Secretary in the promotion of that light had been to a certain extent successful. Since the issue of the Directors' report, they had received intelligence that the Government had consented to the establishment of an installation of the light at Malta. The Chief Secretary had been very persistent in this matter. He was a man of the highest position, and of marked ability; but he seemed to have formed rather a low estimate of the abilities of the other members of the Government, judging from the nature of his arguments to them. He told them that the electric light would turn out a perfect gold mine; that it would be much cheaper than gas; and that, as an investment, it was quite equal to Consols. Besides this, if adopted, they would be able, from the revenue, to increase the salaries of the civil servants, of the employees at all the charitable institutions, and of the teachers in the primary schools; and, indeed, there was no end to the benefits which were to be derived from it. These fallacies were combated by many of the members of the Council and by the Company's Manager (Mr. Starkey). Having mentioned that the decision of the authorities on this subject was extremely unpopular, and had caused widespread dissatisfaction in the public mind, the Chairman observed that some time must elapse before the light was brought into use, and even then he did not think it would seriously affect the Gas Company's interests. Speaking of Corfu, he said they had also a decrease there in the gas-rental, owing to the cloud that was hanging over everything in the shape of Greek enterprise, and which had led to the closing of the theatre and all festivities—resulting in a decrease in the gas consumption of about 5½ per cent.; but this had been attended by a slight increase among the private customers. The electric lighting contract which the Municipality had offered a company, and which they had looked upon as an accomplished thing, had entirely fallen through; and in consequence they were now in negotiation with the municipal authorities for the supply of gas to the public lamps. He could not at present say anything as to this, beyond remarking that the Company would be freed from a very unprofitable contract; and, if they entered into a new one, it would be on something like fair and equitable terms. It would, however, involve the construction of additional works at Corfu; but for this the Directors were quite prepared. As to the Sicilian stations, there had been no improvement in the export trade of Sicily; but the Company had done very well there during the past year. At Trapani, they had an increase of 5 per cent.; and at Marsala, 8¾ per cent. With regard to the condition of the works, they had been carefully inspected and fully reported upon; and the Directors had used their judgment as to the apportionment of the expenditure to the respective stations. They were all in good order, and were improving in structural value every year. The Chairman then moved the adoption of the report and accounts.

Mr. J. Orwell Phillips seconded the motion.

Mr. R. Hesketh Jones ventured to differ slightly with the Chairman with reference to the treatment of the so-called reserve account of £16,000. It was a misnomer, he said, to call this a "reserve account." Some of the works were under concessions that were expiring; and it was usual in cases of this kind to have an *amortissement* account. The £1500 which had been put aside this year to reserve account was equal to 1 per cent. upon the capital; and this was none too much. He thought it would be far better if the account were re-named, and some such word as *amortissement* substituted for reserve, so that the shareholders might see the object for which the account was formed.

The Chairman remarked that Mr. Jones proposed a change in the name of the account; but he was hoping he would have gone farther, and proposed changing its character, because, if it was to have any value beyond what it at present possessed, it was necessary that it should be separately invested. This would mean, however, calling money up at 6 per cent. and investing it at 3 per cent., which was rather a financial luxury. The reserve account was applicable to a great number of purposes—certainly to the objects of an *amortissement* account; and in its existing form, it might be said to be invested at something like 10 per cent. compound interest.

Mr. Smith, alluding to a suggestion made by Mr. Dodgson at a previous meeting as to the conversion of the preference shares into stock, with a view of obtaining a quotation on the Stock Exchange, asked whether any further attention had been given to this matter.

The Chairman replied that the Directors had given a great deal of consideration to the question, and had gone so far as to have a case laid before Counsel; and his opinion was distinctly against the supposition that the Company had any power to effect the proposed change. The only way in which it could be done was by obtaining a Special Act of Parliament; but they would have great difficulty in obtaining an Act which would allow them to obtain money with the freedom and privileges they at present possessed.

On the motion of Mr. Phillips, seconded by Mr. Stephenson R. Clarke, dividends were declared at the following rates per annum; 7 per cent. on the first preference shares, 7½ per cent. on the second preference shares, and 6 per cent. on the ordinary share capital.

Mr. Newbury proposed, and Mr. R. H. Jones seconded, the re-election of the retiring Director (Mr. Paddon). This having been agreed to, Mr. Westbrook moved, and Mr. Cash seconded, the reappointment of the Auditors (Messrs. Jones and Guyatt).

In suitable terms, the services of the Chairman and Directors and officials were acknowledged; and the proceedings then terminated.

LANCASTER CORPORATION GAS AND WATER DEPARTMENTS.

The Annual Accounts.

At the last Meeting of the Lancaster Town Council, the minutes presented by the Gas and Water Committees contained the general financial results of the working of their departments during the past year.

The Gas Committee stated that their Manager (Mr. C. Armitage) had reported that the net profit on the gas undertaking for the year was £930; and that they had resolved to recommend the Council to place this amount to the renewal fund, in reduction of the present debit balance of £7634 on the fund.

Mr. Helme, in moving the adoption of the minutes, remarked that the principal part had reference to the disposal of the £930 profit on the undertaking, by transferring it to the renewal fund in reduction of the debt. It was not advisable at that moment to enter into a general discussion on the Gas Department, for certain suggestions of the Accountant had been taken up by the Finance Committee, with a view to strengthening the position of the undertaking in respect to the sinking fund. As the Committee were dealing with this matter along with the several Committees of the Corporation, he thought it inadvisable

to discuss their position that day in detail, as there would be another opportunity for doing this.

Mr. BOWNESS, in seconding the motion, observed that the Committee were still making improvements.

The minutes of the Water Committee stated that the Accountant had submitted the accounts of the department, which showed a net profit of £4383 for the year. They had resolved that the Council be recommended to appropriate the profit as follows: Renewal fund, £2383; and borough fund, £2000. The Committee also informed the Council that they did not anticipate that the department would be in a position to continue so large a contribution to the latter fund.

Mr. HUNTINGTON moved the adoption of the minutes; and, in doing so, he referred first to the final sentence in the above. He remarked that, at the last meeting of the Council, it was suggested that £1500 should be provided by the Water Committee, and £500 by the Gas Committee. The latter, however, did not see their way to provide £500. He did not find any fault with them, because, comparing the two Committees, perhaps the Gas Committee were at a disadvantage over the Water Committee, inasmuch as the prices for gas were below the average, while the charges for water were a little higher. They had empowered their officials to prepare a new scale, whereby they could regulate the charges for water in the future; and they must also admit that the Gas Committee had from time to time to expend from revenue large sums of money in keeping abreast of the times. They had telescoped one of their gasholders, and built large sheds for storing coke and coal; while, on the other hand, the Water Committee had not recently been doing anything specially—in fact, they had refrained from spending any money in relaying mains until some scheme was formulated for the storing of water, which was the question before them. As to the year's affairs, the total receipts were £11,263; and the profit, £4383. He wished to add the contribution which the Water Committee made to the baths. They supplied the baths with 4,508,000 gallons of water, which, at sale price, would amount to £116. In addition, they had put down new water-mains for the use of the baths, and a new meter; the expenditure altogether on the baths and washhouses being £249. Independent of the water for street purposes and flushing, these were considerable items. In 1888-9, the total profit on water amounted to £1105; while this year it was £4383. This increase had been pretty gradual. It might be accounted for principally by the weather and the debt redemption. In 1889-90 the total receipts for water supplied amounted to £8429; and they had advanced up to the sum of £11,263. This pointed to a steady increase in the demand for water. The receipts for meter-rents had increased the amount they had received from water from other sources. The sum received from water-rents was £5188; while from meter-rents, it was £6075. This was accounted for by the large sale of water to Morecambe; and by the great demand during the dry season for water for trade purposes. This was £1700 more than the year before. They proposed to place the balance of £2383 to the renewal fund. This fund now stood at £8900; but they would soon have to considerably reduce it by paying for extensions.

The minutes were adopted.

COVENTRY CORPORATION GAS SUPPLY.

Annual Accounts.—Reduction in Price.

At Tuesday's Meeting of the Coventry City Council—the MAYOR (Alderman Singer) presiding—the Gas Committee submitted their report and accounts for the year ending March 25 last. From these it appeared that, after providing £1462, the year's payment into the sinking fund, there was a net surplus profit of £3250, as against £1103 in the previous year, and £309 the year before. Of this £930 was paid into the general district fund before the end of the year; and the balance of £2320, the Committee stated, was available in further relief of the rates. The quantity of gas made during the year was 335,987,000 cubic feet, which was an increase of 6,697,000 feet; being equal to 2·03 per cent. The number of consumers on March 31 last was 6069, which was an increase of 54. The gas-stoves on hire numbered 1392, which was an increase of 69. The increase in the consumption of gas over the previous year had amounted to 3·6 per cent.; and the Committee attributed the large increase in the profits to the economy in manufacture effected by the new inclined retorts, and the improvement in the market for residuals. The extra amount paid for coal in consequence of the strike last year was £2100. Concerning the price of gas, the Committee said that in 1891 it was reduced from 2s. 9d. to 2s. 8d. per 1000 cubic feet within the municipal boundary, and from 3s. 9d. and 3s. 3d. to 3s. 2d. for places outside; and they recommended that, after June 24 next, the price should be further reduced to 2s. 7d. within the boundary, and 3s. 1d. outside. It was not proposed to disturb the rebates allowed to large consumers.

Mr. W. ANDREWS, in moving the adoption of the report, said that no further capital had been borrowed, except £10,000 or £11,000 at 3½ per cent., which was required to repay the same amount at 3½ per cent. The capital expenditure during the year had been only £375. Regarding the business of the year, there had been an increase in the quantity of gas sold of 10 million cubic feet; and the amount produced had been about £1400 more than in the previous year. Therefore, taking it all round, the gas undertaking might be looked upon as being in a favourable position. On the last occasion, he had to explain that there had been a large falling off in the receipts for tar—indeed, that there had been a drop of no less than £1400. They had only recovered this to the extent of about £200 during the past twelve months. The amount received for tar three years ago was £2229; the next year it was £850; and last year it was £1077—showing an increase of £200, so that they were still £1200 behind what they were three years ago. The great feature of the year had been the considerable increase in the value of sulphate of ammonia; and this residual had realized £1300 more. There had been an advance of £4 per ton in the selling price; and he was glad to say that this was likely to continue—contracts having been made for some months at that price or even a little more. On the payments side, although the gas sold had been quite £1400 more than last year, there had been less paid for carbonizing wages. This was owing greatly to the new inclined retorts. For coal they paid £700 more than in the preceding year. This was accounted for by the increased make of gas. The result of the trading operations was that the Gas Department was able to declare a surplus profit of £3249, which was the largest amount in any one year since the undertaking had been in the hands of the Corporation. The report stated that the whole of the works and distributing plant had been kept in good working order. This year, however, the renewals and repairs had not been kept up to the full amount. The reason for this was that, in face of the coal strike, the Committee did not see their financial position clearly, not knowing exactly how long the strike would last; and the repairs and renewals had been somewhat delayed. Still, at the same time, the Committee had made provision for them out of the revenue before declaring the amount of surplus profits. It would be seen from the report that the Committee recommended a reduction in the price of gas of 1d. per 1000 cubic feet all round. The prospective finances would very well bear this reduction; and there was every prospect of a satisfactory balance of surplus profit this time next year. Alluding to the coal strike, he stated that when it commenced the Committee had a large stock in hand; but at the end of three months, they found themselves in a very serious position respecting the future supply. A special meeting of the Committee was held, when it was decided to furnish the city with a full supply of gas, whatever the cost might be. Therefore they had to go into the open market and buy coal at any price they could get it at; and the result was that in four weeks they had expended £2100 over the contract prices. Had it not been for this, the surplus profit would have been £2000 more. With regard to this amount, he might say the question at once arose at the beginning of the strike whether the coalowners would be liable to make good these losses; and the coal-owners were at once informed that they would be held responsible to the Committee for any loss sustained. But the Committee obtained Counsel's opinion on the point, and were advised that the coalowners were in no sense liable. They were unable to discover whether any other town had succeeded in making the coalowners responsible. The result pointed to the necessity of having a larger store of coal than they had at present; but they wanted more accommodation. The Committee had had this matter under consideration during the last six months; and when any new arrangement had been decided upon, the Council would be informed of their proposals.

Mr. HAYWOOD seconded the motion.

Mr. WORMELL heartily congratulated the Committee on the increased revenue; and, in the course of a long speech, he expressed the opinion that the coalowners brought about the late dispute, and were therefore responsible to the Corporation. Some contracts were worded so that colliery owners could claim exemption under a lock-out, or almost any circumstances. But the contracts with the Coventry Gas Department were not so worded; they simply exempted the colliery owners in case of strike or accident to machinery.

Mr. DRINKWATER, a member of the Gas Committee, said he did not think it was right for them to make such a large amount of profit. His opinion was that the price of gas should be reduced another 1d., and brought down to 2s. 6d.

After further discussion,

Mr. ANDREWS replied, and said, with regard to the suggestion that a further reduction should take place in the price of gas, that he was not quite certain whether Mr. Drinkwater was right in that. The Committee preferred rather to make a moderate reduction, and keep on the safe and sound side. If it was found, at the end of six or twelve months, that the profits would bear a further reduction in the price of gas, he was quite sure the Committee would be only too happy to reduce it. Their policy had always been to give the consumers, as far as possible, the benefit of any reduction in the price of gas; but at the same time to keep up a moderate amount of surplus profit for the ratepayers—in other words, to divide the profits as far as possible between the two.

The report was then adopted.

HEYWOOD CORPORATION GAS SUPPLY.

Annual Report of the Gas Manager.

The Manager of the Heywood Corporation Gas Department (Mr. W. Whatmough) has presented to the Gas Committee his report for the year ending March 25 last. He commences by referring to the outlay on capital account for the year, which shows an increase of £283, and then proceeds: The gross revenue for the year amounts to £17,180, and the gross expenditure to £16,246; leaving a net profit of £934. This amount, added to the balance of £36 on profit and loss account for 1893, gives a total of £970, from which the Committee have decided to transfer the sum of £300 to the district fund in aid of the rates; leaving a balance of £670 to be carried to the reserve fund, which now amounts to £689. The total expenditure charged to the reserve fund is £288; leaving a net balance of £401. The receipts for gas sold for all purposes amount to £13,625; being an increase of £362. The total increase for residuals amounts to £891, due principally to the large sum realized for sulphate of ammonia, which is £1110, or £559 more than in the previous year. Coke also shows an increase of £273, in consequence of the advanced prices received. On the coal and cannel account there has been an expenditure of £6553, against £5990, or an increase of £562, due to the additional cost of coal during the coal strike. On repairs and maintenance of works, there is a decrease in expenditure of £495; and this large difference is caused by the alterations executed last year being charged to this account. The item of rates and taxes now amounts to the sum of £949, or an increase of £119. During the year 1202 tons of cannel and 8231 tons of coal have been carbonized; being an increase of 358 tons, and a decrease of 284 tons respectively, or a total decrease of 88 tons as compared with 1893. The total quantity of gas manufactured amounts to 92,865,000 cubic feet, being an increase of 474,000 cubic feet, or

0·51 per cent.; and the average yield per ton of coal carbonized is 9846 feet. The total quantity of gas sold amounts to 82,186,371 cubic feet—an increase over last year of 2,399,248 cubic feet, or 2·91 per cent. Of the gas sold 69,087,663 feet have been used by ordinary consumers, and 7,490,400 feet by stoves and for motive power—the former showing an increase of 2·48 per cent., and the latter of 26·93 per cent. The quantity of gas not accounted for is 9,678,629 cubic feet, representing a leakage of 10·42 per cent., and a reduction of 1,557,598 cubic feet. During the year the number of meters increased from 4513 to 4592; public lamps, from 746 to 751; gas-stoves on hire, from 319 to 373; gas-stoves purchased, from 62 to 71; gas-engines, from 12 to 14; and the number of grillers and burners let on hire was 18. In conclusion, Mr. Whatmough congratulates the Committee upon the satisfactory result of the year's working, which, as he says, would no doubt have been much better but for the disastrous coal strike; and although the department suffered much loss and inconvenience in consequence of having to purchase coal of an inferior quality at a high price, the Corporation did not fail to give to the consumers a satisfactory supply of gas of good quality, and without increasing the charge.

DUKINFIELD LOCAL BOARD GAS SUPPLY.

The Gas Manager's Annual Report.

The report of Mr. Harrison Veevers, the Engineer and Manager of the Dukinfield Local Board Gas-Works, for the year ending March 25 last, has been submitted to the Board. It opens with the statement that he has again to record an unsatisfactory result of the year's work. The balance was affected last year by the diminution in the supply of gas, owing to a prolonged dispute in the cotton industry, coupled with an unusual falling off in the price of residuals. This year it has been unfavourably influenced by the increase in the cost of raw material, due to the dispute in the coal trade. Some of the residuals have yielded an increased amount—sulphate of ammonia to the extent of £174, and coke to the total of £80. But these improvements, and lessened expenses in some items of manufacture, have been overpowered by an additional cost of £820 for coal, which had to be bought at a rise, on an average, of 7s. 5d. per ton. The result is a loss of £720 on the year's working. The net cost of making and distributing gas in the past financial year was 2s. 0·95d. per 1000 cubic feet sold as compared with 1s. 11·59d. in the previous year. Adding the annuities, interest on loans, sinking fund, and bank interest, the total is 3s. 1·14d., against 3s. 0·01d. in 1892-3. As the present average price of gas is 2s. 10·01d., the loss works out to 3·13d. per 1000 cubic feet, as compared with 2·96d. in the preceding year, when the average price was 2s. 9·05d. During the past twelve months, there was an expenditure, out of the balance of the profit and loss account, of £35 on renewals of purifiers. The total make of gas amounted to 60,916,000 cubic feet, of which 55,227,300 cubic feet were sold and 5,688,700 cubic feet unaccounted for, or equal to 9·33 per cent. Mr. Veevers suggests the formation of a renewal fund, for replacing the more important manufacturing and storeage plant, by the contribution of £300 yearly from the revenue account. This sum, with its accumulated interest at 3 per cent., would, he says, suffice for the purpose. The works and mains are in good order; but the provision of a covered coal-store is urgently needed. Mr. Veevers states that, if the works had been stocked with sufficient coal at the commencement of the recent coal difficulty, the revenue account would have been £820 better; and the balance-sheet consequently a more favourable one. He concluded by recommending to the serious attention of the Committee the necessity of encouraging the increased consumption of gas for lighting by the use of prepayment meters, as well as for power and heating purposes.

A Water Scheme for Selston.—The Basford Rural Sanitary Authority having applied to the Local Government Board for power to borrow £13,000 for supplying the parish of Selston with water, General Crozier, R.E., held an inquiry into the matter last Thursday. Mr. Hodson, who is Engineer to the scheme, gave evidence to the effect that water would be pumped from a well near the Annesley Tunnel of the Manchester, Sheffield, and Lincolnshire Company, and 17 miles of pipes would be required to supply the sixteen hamlets in the parish; the population being estimated at 8000. The spring was calculated to yield more than would be required. Witnesses were called to show that the present well supply was not satisfactory.

North Shields Water Company.—At the annual meeting of this Company last Thursday week, the Directors reported that there had been an increase of £227 in the revenue; but the expenditure had been very heavy, owing to the extensive repairs necessary during the past year. The gross revenue amounted to £10,651; and the expenditure, including the sum paid for water to the Newcastle and Gateshead Water Company, and also the interest on loans, came to £7958—leaving a profit of £2692. The Directors recommended the payment of a dividend of 3 per cent. It was also stated that £583 (payable in September next) was due to his Grace the Duke of Northumberland; being his one-seventh share of the clear annual profit. After disbursing these amounts, £259 will remain to add to the balance at the credit of profit and loss account.

The Local Government Board and the Dublin Corporation Water Supply.—The Local Government Board have addressed a letter to the Dublin Corporation with reference to the decision which they have given respecting the application by the Kingstown Township Commissioners for powers to construct separate works for Kingstown and Dalkey. The Board state that, while the drought of last year should be regarded as an "unforeseen" occurrence, the Corporation, with the experience of that exceptional season before them, have a serious responsibility as to the taking of such steps as may be deemed necessary to protect the inhabitants of Dublin and the surrounding townships concerned in the Vartry supply against the consequences of the possible recurrence of an event which can no longer be regarded as "unforeseen."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Lord Low, in the Court of Session, has now disposed of the action with reference to the imposition of a gas contingent guarantee rate at Lockerbie. His judgment is, of course, not final; but it enables me to write on the subject. His Lordship goes against the contention of the Gas Commissioners, and forbids them imposing the rate. Happily the subject has not been one of much concern to corporations owning gas-works, for in no other instance, so far as I am aware, has it been necessary to impose such a rate. As, however, a time might come when it would be thought by others to be advisable to impose a contingent rate for a few years—which was all that was proposed to be done in Lockerbie—the subject becomes of importance to all. I must say I think Lord Low's decision is wrong. Put briefly, the Commissioners are, by the Burghs Gas Supply (Scotland) Act, 1876, cap. 49, empowered to borrow money for the purposes of the gas undertaking; and they are required to set apart from their revenue every year after the second from their commencement one-fortieth of the amount borrowed, so that the whole debt should, were none other created, be extinguished in 42 years. Their powers for the levying of the contingent rate do not extend to the repayment of borrowed money, but only to the payment of interest upon it, and the payment of annuities. It is therefore quite true, as Lord Low remarked, that the contingent rate is for the protection of the lender and the annuitant; but that does not settle the question. On the contrary, it might be argued, it but opens up to the Corporation the power to impose the rate. If, as Lord Low says, the obligation to raise sufficient to meet all charges is imperative, where would be the need for protecting any creditor of the undertaking? Provision is made for the reduction year by year of the liability of the Corporation, and for the maintenance of the undertaking; and in the event of an unforeseen circumstance arising which would make it impossible to carry on the works, the creditors would be fully protected by there being sufficient plant on the ground to meet their claims, and their remedy would be by winding up and realization. Then, to provide against that, the power to levy a contingent rate is given. Such a rate would enable the Corporation to tide over a period of bad years, and prevent the works being closed. Suppose the Corporation were obliged to follow such a course as would lead to the closing of the works, the ratepayers would be in probably a worse position than if the contingent rate were imposed at once. All that the Lockerbie Police Commissioners have to do, in order to show the absurdity of the position in which Lord Low's decision would place them, is to allow arrears of interest and annuities to accumulate until the creditors apply to the Court; and a judicial factor would be appointed, regarding whose power to levy a contingent rate there can be no doubt. In addition, there would be charges for his management. Is it to be supposed that the Legislature has given powers to a judicial factor which, to enable them to do the same thing, they have denied to the Corporation? In other words, is it reasonable to say that it was the intention of the Legislature, when they provided a remedy for a sickly undertaking, for the undertaking to be at death's door before the remedy should be applied? I think not; and therefore I conclude that the Legislature intended sections 38 and 41 to be read together, so that the Corporation have the power to manage the gas undertaking for the benefit of the gas consumers as well as for that of the creditors. The Act may not be very plainly worded; but I think it can be made to bear the interpretation I put upon it. Should Lord Low's decision become final, it will impose a limitation upon Corporations which they have not hitherto understood to rest upon them; but should it be appealed against and reversed, corporations will retain a power which they have all along believed they possess—a power, too, which has never been abused, because it has never been exercised. May not the intention of Parliament be read out of the more recent Electric Lighting Acts, in which it is provided that any deficiency arising in any year is, so far as not provided out of the reserve fund, to be charged upon the local rate? If such a reading be not allowed, then it is open to the remark that there is one law for one light and another for another.

The coal miners of Scotland have resolved, by 25,617 votes to 14,490, to come out on strike against the reduction in wages which is now in force. There are about 80,000 workers in mines in Scotland, of whom 67,060 work underground and 13,633 on the surface. It is assumed that about 60,000 are above the age of 16, and were entitled to vote. Of these 40,107 exercised the privilege, though as a matter of fact, 71,000 voting papers were issued. The result of the ballot is by no means convincing that the miners of Scotland desire to strike; yet the Federation leaders, by 23 votes to 6, directed that notices should be lodged for a strike to begin on Monday, the 25th inst. Apart from the opinions of outsiders, it is of importance to observe that the bye-law of the Federation requires "that policy to be adopted which has the largest number of votes *throughout Scotland*." It is impossible for the men's leaders to maintain that they have a majority of the miners; but, on the other hand, they have "the largest number of votes," so that they are acting according to rule in directing a strike. That is, however, their business. What is of more consequence, both to the miners and the general public, is how far the men who have voted against striking will support those who may come out. That some of them will voluntarily fall in with the majority, there is no doubt; and that more will be picketed into obedience to a strike policy is also certain. The number will, however, be greatly influenced by the consideration of support from England and Wales, which has been promised in a sort of way. No guarantee has, however, been given; and it is already announced that those who do not belong to any Union may not participate in any support which may be given, and further that those who may be members of a Union and who may not come out will be expelled from the Federation, when they will lose all claim to support. All this is, of course, intended to drive men into the Unions, and to ensure that they shall strike. Whatever effect the regulations may have in that direction, they are likely to operate in another. If all the men should come out, it would take between £30,000 and £40,000 a week to give 10s. to

each worker. For how many weeks would the miners of England and Wales be content to give that sum? If, then, the amount of support be small, the defections from the ranks of the strikers are certain soon to become large. There are, too, a considerable number who will not come out; and, of course, they will make handsome wages, which will be another source of defection. But above all, the situation will be dominated by the resolution of the English Colliery Owners' Federation to impose a reduction of 10 per cent. On the one hand, that will reduce the amount of the levy in support of the Scotch strikers; but what is more important, it must either compel the English miners to come out themselves or consent to the Scotch strike being dropped. At the present moment the miners are unable to maintain a general strike over the United Kingdom. It is only by selecting Scotland, as the smaller and weaker unit, and endeavouring to enforce their policy there, that they can hope to succeed. The same tactics were tried by the railway men a year or two ago, and they failed. This movement on the part of the miners is doomed to failure also. Not one single newspaper in Scotland, so far as I have seen, supports them; but all point out the folly of initiating a strike at this moment. Without outside sympathy, the miners themselves are unequal to the task they have set before them. They have not that sympathy; and I should not be surprised if the whole affair ends in collapse.

The Greenock Town Council are, in these days, a peculiar body, in that the majority of them are not enamoured of electric lighting. The subject came before them on Tuesday, in connection with the very small proposal to introduce a better form of gas-lamp for the lighting of the Town Hall. Bailie Cluckie, who likes to have "a hair in the neck" of the Gas Trust, proposed that they should not proceed with the work until they had ascertained what the cost of lighting the hall by means of electricity would be. Following this proposal there was, as might almost be taken for granted, a wail by one of the members that Greenock would soon be behind most other large towns in Scotland. That gentleman was in favour of a more extended system of electric light supply than Bailie Cluckie. On the other side, it was represented that it would be unwise to introduce electric lighting in face of the fact that the Gas Trust is £75,000 in debt. It was also pointed out that a previous experiment with electric light in Greenock was not successful; and the advice was given that they should try to make their gas as cheap as possible. Mr. M'Innes, the Convener of the Gas Trust, thought that when they were about to enter upon the practice of enriching their gas by means of oil they should give electricity a wide berth. Provost Shankland also believed they would regret it if they did anything which would weaken the revenue of the Gas Trust. Electric lighting, in his opinion, might be the light of the future; but he hoped that none of them would ever see it in the Greenock Town Hall. The Council then, by 10 votes to 8, agreed to the proposal to improve gas lighting. The incident is very instructive, when it is remembered that the Greenock Town Council are not above helping themselves to considerable portions of the profits upon their gas undertaking. They are evidently wide-awake enough to know that there would be no profits upon electricity, but a deficit, which would swallow up the balance on the gas account. This was presumably their motive for giving electricity such drastic treatment. In the case of other corporations, the members pile on extravagances the cost of which is to come out of the pockets of the ratepayers; but in Greenock, where the extravagance would interfere with the funds in their own hand, they are more careful.

At the meeting of the Hamilton Town Council on Thursday, it was intimated by Bailie Brown, the Convener of the Gas Committee, that it was proposed to make a very material reduction in the price of gas; but that the Committee had delayed fixing the amount until they should settle their coal contracts. Mr. Keith, whom we have heard of before as a non-content, raised the subject of the rise in the average amount of the consumers' accounts. In 1892, he said, they had 3026 consumers; and the average annual account of each consumer was £2 8s. 5d. Now they had 3204 consumers; and the average account was £2 15s. 5d., which was equivalent to a rise of 10 per cent., or £800 in all. There were numerous complaints from consumers that the amount charged them was on the increase, while they were not conscious of having burnt more gas. He suggested that they should ascertain how much of this £800 was received for gas consumed in gas engines and stoves. There was a feeling that possibly there might be some difference in the quality of the coal used, or that the exhauster might be very much overtaxed, and that consequently they were getting furnace gas instead of true gas. Mr. Keith also suggested that they should institute a depreciation fund, setting aside 5 per cent., or £1500 a year, to it. If this had been done last year, they would have been £940 to the bad, instead of £60 to the good. To these criticisms Bailie Brown replied that complaints about increased accounts had existed ever since he could remember, and that they had now some very large consumers, which might raise the general average. As to the depreciation account, he reminded them that nothing was placed to it last year because they had spent an unusual amount both on renewals and ordinary repairs. Mr. Tainsh, another member who is not a very enthusiastic supporter of the Gas Committee, suggested that the higher charges for gas might be due to increased pressure; and he thought they might erect a new holder at Burnbank, to relieve the pressure. There might be something in Mr. Tainsh's remarks, provided he can establish that there is increased pressure; but Mr. Keith does not criticize wisely, though he makes a brave show of intimacy with gas making.

Sulphate of ammonia is reported as selling—or rather as being quoted by sellers—at £14 6s. 3d. per ton. It is said to be well held; and there is a belief that some consumers will be cornered before long. A year ago business was being done at about £12.

The Barrowfield Iron-Works, Limited, of Glasgow, have secured the contract for supplying the coal-hoppers and the framing for the elevators in the second retort-house which is being fitted up with mechanical stoking and conveying plant in the Dawsholm works of the Glasgow Corporation.

Gas-Works Extensions at Hereford.—It was reported by the Gas Committee at last Tuesday's meeting of the Hereford Town Council that they had obtained the sanction of the Treasury to borrow £7500 for the extension of the gas-works.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June* 9.

Sulphate of Ammonia.—The market remains *in statu quo*, with the only difference perhaps of a little more reserve on the part of buyers, among whom the persistent advance seems to have created some consternation. Many consumers confidently expected easier prices after the completion of the spring requirements, especially when there was a conspicuous falling off in the shipments. But curiously prices took the opposite turn; and the accumulation of stocks proved a forlorn hope. Opinions as to the future differ greatly at the present moment. Some anticipate a further advance in view of the many requirements unprovided for; others think that prices have reached a sufficiently high level to correspond with the position; none at present look for the lower values foretold, with some assurance, about a month ago. The consumption of nitrate has been considerably larger this spring to the detriment probably of sulphate. But nitrate cannot possibly take the place of sulphate during the summer; the former being, as so often remarked, unsuited for mixing. The highest price so far—£14 5s.—has been paid in Scotland. At Hull and Liverpool, £14 2s. 6d. has not been exceeded; but future contracts to December and even March next are reported—prices ranging between £13 17s. 6d. and £14 2s. 6d., according to periods of delivery. In this way a large portion of the coming production is being already dealt with. This ought to be a warning to those consumers who are standing aloof, and make them alive to the danger of a difficulty of finding supplies when wanted. Makers, on the other hand, seem to be acting discreetly in accepting values which are about 30s. per ton above the average of 1893. The shipments during May are slightly in excess of those of last year. Nitrate is steadier at 9s. 10½d.

LONDON, *June* 9.

Tar Products.—It is interesting to report that the low price of benzol, and its great and recognized economic value for enriching gas, has at last induced several enterprising gas managers to utilize it. German gas managers, as usual, have been the first to apply benzol for fortifying gas on an important scale. As it takes three times the quantity of petroleum spirit to do the same work as benzol, it will be seen what a cheap agent it is for carburetting purposes. Its use, moreover, would relieve the glut of benzol, which is now depressing the market, and would immediately improve the value of tar. Carbolic acid is in better demand; but the price does not improve much. Other products are more or less quiet; and, although the price of anthracene is maintained, no new business is reported. Values may be taken as follows: Tar, 13s. to 17s. Pitch, 28s. 6d. Benzols, 90's, 1s.; 50's, 1s. 3d. Solvent naphtha, 1s. 2d. Creosote, 1½d. Creosote salts, 20s. Toluol, 1s. 6d. Cresylic acid, 1s. Crude benzol naphtha, 30 per cent., 5d. Carbolic acid, 60's, 1s. 8½d. Anthracene, "A," 1s. 2d.; "B," 10½d.

Sulphate of Ammonia, after two or three weeks' continued animation, is now steady, at £14 to £14 5s., less 3½ per cent., and is inclined to quiet down. There is no reason for the price receding; and, as there are no stocks, it is hoped manufacturers will not play into the hands of "bears," who may now find an opportunity to again depress the market. Gas liquor is quoted at 11s. to 13s.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—It would seem pretty evident that there is again to be a very keen competition for the gas coal contracts. Any real power which the Lancashire Coal Sales Association has possessed in the way of controlling prices is gradually disappearing; and I understand that the meetings recently held have been so thinly attended that the decisions come to are scarcely likely to carry much weight with not a few of the coalowners who still remain, very reluctantly, members of the Association. The arrangement with regard to the tenders for the Manchester gas coal contracts, was in itself evidence of weakness, as the Association had practically to abandon the firm stand which they in the first place sought to take, that nothing less than 1s. per ton above last year's prices should be accepted. Even with the understanding that tenders may be based upon prices not more than 6d above those of last year, it seems doubtful whether the Lancashire collieries who adhere to this arrangement will not find themselves undersold. It is reported that the Manchester Corporation have under consideration supplies obtainable from Scotland; but whether Scotch coal could be delivered at prices to cut out the local supplies, would seem to be doubtful. With regard to gas coal prices, the general quotations, so far as can be gathered, remain much as those given last week. Ordinary screened gas coal is about 8s.; and good screened Arley, about 9s. per ton at the pit. So far as other descriptions of round coal are concerned, the position generally is much as reported of late; the demand continuing extremely small, with stocks accumulating. Although list rates in the Manchester district and the general pit quotations remain unchanged, the Lancashire Coal Sales Association have found it necessary to give way about 6d. per ton upon what may be termed the delivered prices at stations in the various important districts on the east side of Manchester, lying between Derbyshire, Yorkshire, and Staffordshire. At the pit mouth, quoted prices remain at about 11s. to 11s. 6d. for best Wigan Arley; 10s. to 10s. 6d., for Pemberton four-feet and seconds Arley; and 7s. 6d. to 8s., for steam and forge coals. Engine classes of fuel meet with a fair demand, and Lancashire collieries have no difficulty in disposing of their present very limited output; but there are plentiful supplies of cheap fuel from other districts, which render it difficult to maintain recent full rates. Slack ranges from 5s. 6d. to 6s. 6d., according to quality; ordinary burgy, 6s. 6d. to 7s.; and through-and-through coal, 6s. 9d. to 7s. 3d. per ton at the pit mouth. For shipment there is still only a very limited inquiry; and although the Association list rates remain at 8s. 6d. to 9s. delivered at the ports on the Mersey, there are sellers in the outside market at quite 3d. to 6d. under these figures.

Northern Coal Trade.—There has been a stronger demand for coal; and this is in part due to the belief that a strike in Scotland is imminent, to an extent that will considerably affect the coal trade. Hence consumers have shown a desire to get in large stocks, and shippers to send coal more freely away; so that the output has been much better taken up, and the working time at collieries has been fuller. Best Northumbrian steam coals are firmer; and some collieries ask higher prices—rates ranging from 10s. 3d. to 10s. 6d. per ton f.o.b. Second-class coals are steady at 9s. to 9s. 6d.; and steam smalls are quiet at about 4s. 6d. to 4s. 9d. per ton. For gas coal, there is a slightly increased demand; but many of the collieries are still working very short time. The prices of gas coals range from 7s. to 7s. 6d. per ton f.o.b., though one or two collieries ask as high as 8s. per ton. The demand is rather better than it was; but not till after the end of the present month is it likely to be heavy. Coke is steady at about 13s. to 14s. per ton; but the exports are limited, though there is a good demand for local consumption. There is no change of moment in the gas coke trade this week. Any alteration in the position in Scotland would be speedily reflected in this district; and there are very many who doubt whether there will be a serious strike in either Scotland or Cumberland. But until this is definitely settled, the large users of coal will endeavour to increase their stocks; and this considerably improves the present demand for coal, though it might be followed by a reaction if the strike does not eventually make coal scarce. A few days will determine this, and show the position of the coal trade for at least the summer months.

Scotch Coal Trade.—The threatened strike among the miners of Scotland is as yet producing comparatively small commotion in the coal trade. It is generally expected that there will be little strike; that, if it does take place, it will be of short duration; and that its result will be to enable the masters not only to continue contracts at present prices, but even to further reduce wages if they think fit. In the meantime, the masters have announced that they do not intend to make restoration of any part of the reduction; and so, if the men strike, they do so knowing what to anticipate. Coal is moving off a little more freely this week; and prices have improved slightly, under the panic which might be expected to follow the announcement of a strike. Contracts are not to be thought of until the issue of the conflict can be seen. The quotations this week are: Main, 7s. to 7s. 3d.; ell, 8s. 3d. to 8s. 6d.; splint, 7s. 9d.; and steam, 9s. to 9s. 3d. per ton f.o.b. Glasgow—not very much above last week. The shipments amounted to 142,978 tons—a decrease upon the preceding six days of 15,971 tons, and on the corresponding period last year of 16,361 tons. For the year to date, the total shipments have been 3,040,325 tons—an increase of 337,098 tons.

Starting of the Electric Light Installation at Portsmouth.—Last Wednesday, the installation of electric lighting at Portsmouth was formerly started by the wife of the Mayor (Mrs. Emanuel) performing the opening ceremony. In the evening the Mayor gave a banquet in honour of the occasion. The cost of establishing the new light has been upwards of £60,000.

Woodbridge Gaslight and Coke Company.—The annual meeting of this Company was held yesterday week, when it was reported that the balance on the profit and loss account for the year ending March 31 was £1345, including £363 brought forward, and £5 interest on the reserve fund. With the interim payment, the dividend declared made 10 per cent. for the year; and a balance of £555 remains to be carried to the next accounts.

Reduction in the Price of Gas at Blackpool.—The Blackpool Town Council have reduced the price of gas to 2s. 4d. per 1000 cubic feet. At the meeting of the Council last Tuesday, this proposal was opposed by Mr. Ward; but a proposition of his to the effect that the price remain unaltered, seeing that their capital was nearly £100,000, and was only producing an annual profit of £2000, fell to the ground. Mr. Ward's contention was that £2000 was insufficient for contingencies on such a capital.

Exhibitions of Gas Appliances.—Last Tuesday, Messrs. J. Wright and Co., Limited, opened an exhibition of gas appliances in the Corn Exchange, at Darlington; and it was continued till Friday. Miss Beatrice Shaw delivered cookery lectures twice daily.——Messrs. W., Parkinson and Co. held a similar exhibition in the Victoria Rooms, Oswestry, from Tuesday to Friday last week, with the co-operation of Miss Sanderson as lecturer. This week they are holding exhibitions at Bromyard and Moreton-in-Marsh; the same lady continuing her interesting lectures.

The Plymouth Corporation and the Gas Company.—The minutes of the Special Purposes Committee of the Plymouth Corporation which were to come before the Town Council at their meeting yesterday, contained a long report by the Town Clerk (Mr. J. H. Ellis) with reference to the Bill of the Plymouth and Stonehouse Gas Company. It will be seen by our "Parliamentary Intelligence" that this Bill has reached the Upper House, where it is to be further opposed by the Corporation, with the view, if possible, of obtaining the insertion of a clause to enable them to promote a Bill for the purchase of the Company's undertaking.

The Proposed New Gasholder for Middlesbrough.—A special meeting of the Gas Committee of the Middlesbrough Corporation was held last Wednesday to consider the question of the proposed new gasholder, for which, as already mentioned in the JOURNAL, tenders have been submitted by Messrs. Ashmore, Benson, Pease, and Co., Limited, and the Whessoe Foundry Company, Limited. Certain letters which had been received from the two firms named since the last meeting of the Town Council were read; and a long discussion ensued on the respective merits of rope-guided and frame-guided gasholders. The Chairman (Alderman Hugh Bell) moved that Messrs. Ashmore's tender for a rope-guided gasholder be accepted; whereupon Alderman Bulmer brought forward an amendment to the effect that no rope-guided holder should be erected by the Corporation. On a vote being taken, six were recorded for both the motion and the amendment. The Chairman then gave his casting vote in favour of the motion, which will to-day come before the Council for confirmation.

West's Gas Improvement Company, Limited.—This Company has been registered with a capital of £100,000, in £20 shares, "to acquire the business of manufacturers of machinery and apparatus connected with the manufacture, purification, storeage, distribution, and employment of gas, as hitherto carried on by the West's Gas Improvement Company, Limited, at the Albion Iron-Works, Miles Platting, Manchester; with a view to the above objects, to enter into an agreement with the old Company, its Liquidator, and John West; and to carry on business as gas, electrical, and mechanical engineers and iron-founders, millwrights, metal workers, manufacturing chemists, builders, contractors, &c."

Buenos Ayres (New) Gas Company, Limited.—In reporting upon the affairs of this Company during the year ending Dec. 31 last, the Directors mention with satisfaction that, notwithstanding the severe financial crisis which so seriously impairs the trade and industry of the Argentine Republic, the improvement in the business referred to in their previous report has not only been maintained, but exhibits a marked advance over that of the preceding year, besides which the amounts due by the Municipality and other consumers have been very largely reduced. Satisfactory as this is, the position of the business has been seriously affected by the currency. Although the price of gas in paper dollars has been materially increased, it has been found impossible to keep pace with their rapid depreciation. The gross receipts amounted to no less than $1,997,212·73; and the profits, to $1,175,219·26; but, as a result of the adjustment of all currency items in the accounts to a sterling value, this profit is reduced to £24,979, which, however, shows an increase of £13,394 over 1892. The quantity of gas consumed was 5 per cent. in excess of the previous year. An increase was also made in the number of services laid, notwithstanding the severe competition with other Companies. Considerable reduction was effected in the cost of production, owing to cheaper coal, freights, and economies introduced by the Engineer; and the works are now in a position to supply 1¾ million cubic feet of gas per day. After paying the debenture interest (£12,000), there is a balance of £12,979, from which the Directors recommend a dividend at the rate of 2 per cent. (free of income-tax), 1 per cent. of which has already been distributed. This will leave a balance of £2979 to be carried forward.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1113.)

Issue.	Share	When ex-Dividend.	Dividend for Year. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c.	10	12—13	..	5 15 4
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	107—109	..	4 11 9
100,000	20	14 Dec.	8	Bahia, Limited	20	10—11	..	14 10 10
200,000	5	11 May	6½	Bombay, Limited	5	5—5½	..	5 18 2
40,000	5	,,	6½	Do. New	4	4—4½	..	5 15 6
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	217—222	..	5 3 7
180,000	,,	,,	8½	Do. New	100	167—172	..	4 18 10
220,000	Stck.	15 Mar.	11½	Brighton & Hove Original	100	210—215	..	5 6 11
888,500	Stck.	28 Feb.	5	Bristol	100	109—112	..	4 9 3
320,000	20	29 Mar.	11½	British	20	45—47	..	4 15 10
50,000	10	28 Feb.	11½	Bromley, Ordinary 10 p. c.	10	21—22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	16—17	..	5 0 0
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5—6	−½	3 6 8
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100—103	..	5 16 7
150,000	20	28 Feb.	8	Cagliari, Limited	20	26—27	..	5 18 6
550,000	Stck.	12 Apl.	12½	Commercial, Old Stock	100	253—258	..	4 16 10
165,000	,,	,,	9½	Do. New do.	100	190—195	..	4 17 5
160,762	,,	14 Dec.	4½	Do. 4½ p c. Deb. do.	100	132—137	..	3 5 8
800,000	Stck.	14 Dec.	13	Continental Union Limited	100	237—242	+2	5 7 5
200,000	,,	,,	10	Do. 7 p. c. Pref	100	207—212	..	4 14 4
535,000	Stck.	28 Feb.	5	Crystal Palace Ord. 5 p.c. Stk	100	105—110	..	4 10 11
486,090	10	31 Jan.	10	European, Limited	10	22—23	..	4 6 11
354,060	10	,,	10	Do. Partly paid	7½	15½—16½	..	4 10 11
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	230—235	..	5 2 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—104	..	3 16 11
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	275—280	+2	3 11 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130—135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	190—195	..	3 16 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	177—182	..	3 16 11
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	272—277	..	3 12 3
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	14 Dec.	4	Do. 4 p. c. Deb. Stk.	100	128—131	..	3 1 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	177—182	..	3 5 11
3,800,000	Stck.	11 May	12	Imperial Continental	100	213—218	−2	5 10 1
75,000	5	14 Dec.	6	Malta & Mediterranean, Ltd.	5	4½—5	..	6 0 0
560,000	100	2 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	109—111	..	4 10 1
541,920	20	15 Nov.	5	Monte Video, Limited	20	14—15	..	6 13 4
150,000	5	30 May	8	Oriental, Limited	5	5⅞—6¼*	+⅛	6 8 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	3¾—4¼	..	7 7 4
166,870	10	31 Jan.	2	Pará Limited	10	1¾—2	..	10 0 0
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	102—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	95—100*	..	6 0 0
150,000	10	26 Apl.	6	San Paulo, Limited	10	9½—10¼	..	5 14 3
500,000	Stck.	28 Feb.	15½	South Metropolitan, A Stock	100	317—322	..	4 16 3
1,350,000	,,	,,	12	Do. B do.	100	260—265	..	4 10 6
260,000	,,	,,	13	Do. C do.	100	265—270	..	4 16 3
750,000	,,	17 Jan.	5	Do. 5 p. c. Deb. Stk.	100	153—157	..	3 3 8
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 0
				WATER COMPANIES.				
745,967	Stck.	29 Dec.	10	Chelsea, Ordinary	100	277—282	..	3 10 11
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	223—228	..	3 10 2
544,440	,,	29 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147—150	..	3 0 0
700,000	50	14 Dec.	8½	Grand Junction	50	117—120	..	3 10 10
708,000	Stck.	28 Feb.	11½	Kent	100	290—295	..	3 17 11
1,043,800	100	29 Dec.	9½	Lambeth, 10 p. c. max.	100	255—260	..	3 13 1
406,200	100	,,	7½	Do. 7½ p. c. max.	100	204—208	..	3 12 1
330,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132—135	..	2 19 3
500,000	100	14 Feb.	12½	New River, New Shares	100	367—372	+2	3 5 2
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk	100	134—137	+1	2 18 4
902,300	Stck.	14 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	162—165	..	3 12 9
126,500	100	,,	6	Do. D 7½ p. c. do.	100	147—152	..	3 19 0
1,155,066	Stck.	14 Dec.	10	West Middlesex	100	270—275	..	3 12 9

*Ex div.

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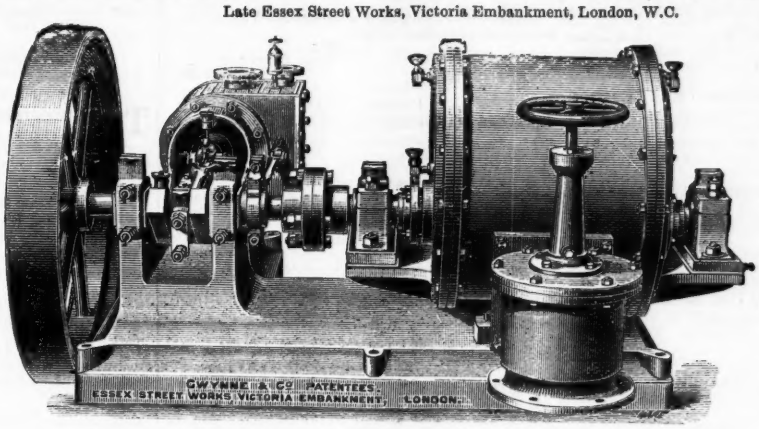

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Address, with price and particulars, No. 2398, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One 60 feet Round Station METER. Has only been used a short time.
Apply to the HAPTON CHEMICAL WORKS, near ACCRINGTON.

FOR SALE—Five Gasholder Pillars, 15 feet high, with Pulleys, Chains, and Weights; to be sold cheap.
Apply to 59, WIGAN ROAD, HINDLEY.

RETORT Mouthpieces and Lids, with mounting, ∩-shaped, 15 in. by 18 in., in good condition; cheap.
Address BLAIRGOWRIE GAS COMPANY, LTD.

FOR SALE—Two 16 feet and Four, 17 feet square PURIFIERS, which have been taken out to be replaced by larger ones.
For Particulars and Prices, apply to W. C. HOLMES AND CO., Gas Engineers, HUDDERSFIELD.

SECOND-HAND GAS PLANT.

FOR SALE—One 6-inch Governor, by Braddock.
One Morris and Cutler's patent CONDENSER, 6-inch Connections.
One Gas Referees' CUBIC FOOT MEASURE.
The above all in good condition.
For Prices and further Particulars, apply to G. W. LUPTON, Gas-Works, OTLEY.

FOR SALE—Two small, 5 feet square, PURIFIERS, with 4-inch Valves and Connections; equal to new. One BEALE'S GAS EXHAUSTER, with 4-inch Connections, in very good repair. Six 16-inch round MOUTHPIECES, with 4-inch Ascension-Pipes, Bridge-Pipes, and other Connections. Also HYDRAULIC MAIN, and 4-inch upright CONDENSERS.
Apply to the MANAGER, Gas-Works, BROMYARD.

COUNTY BOROUGH OF BOLTON.
(GAS DEPARTMENT.)

TWO STATION METERS ON SALE.

ON SALE—Two Station Meters, one to pass 40,000 cubic feet of Gas per hour with 16-inch Connections and Valves (made by Braddock, Oldham), the other to pass 45,000 cubic feet per hour, with 16-inch Connections and Valves (made by the Gas-Meter Company, Limited). The Meters are now in use, in good condition, and being removed to make room for Meters of larger capacity.
Further Particulars may be obtained on application to Mr. William Smith, Gas Engineer, Lum Street Gas-Works, Bolton.
Tenders, endorsed "Station Meters," to be addressed to Alderman Miles, Chairman, Gas Committee, Bolton.
R. G. HINNELL,
Town Clerk.
May 22, 1894.

COCKERMOUTH LOCAL BOARD.
(GAS DEPARTMENT.)

THE Gas Committee of the above Board invite TENDERS for the supply of GAS COAL, delivered at Cockermouth Station, during Twelve Months commencing the 1st of July next.
Particulars to be obtained from the undersigned.
Tenders, with description and analysis of Coals offered, to be sent in not later than June 25, addressed to the Chairman, Gas Committee, Cockermouth.
ER W. SMITH,
Gas Manager.

BOROUGH OF BURTON-UPON-TRENT.

TAR.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS for the purchase of the surplus TAR to be produced at their Works during Twelve Months from the end of July next.
Probable quantity of Coal carbonized during the Twelve Months, 25,000 tons.
The Tar will be delivered free into Contractor's Tank-Trucks, on the Gas-Works Railway Siding.
Payments: Net Cash, Monthly.
Tenders, sealed, and endorsed "Tender for Tar," are to be delivered to me, at or before Ten a.m., on Friday, the 29th of June inst.
The highest or any tender will not necessarily be accepted.
F. L. RAMSDEN,
Manager and Engineer.
Gas and Electric Light Works,
Burton-upon-Trent, June 8, 1894.

BOROUGH OF DARWEN.
(GAS DEPARTMENT.)

TO COLLIERY PROPRIETORS.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for 11,000 tons of GAS COAL, and 3000 tons of CANNEL.
Particulars and Forms of Tender may be obtained from Mr. Thos. Duxbury, Gas Engineer, Gas-Works, Darwen.
Sealed tenders, endorsed, to be delivered to me on or before Saturday, June 23 inst.
By order,
CHAS. COSTEKER,
Town Clerk.

SURPLUS TAR.

THE Gas Committee of the Corporation of Coventry are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Works, Coventry, for One Year from July 1 next.
Make about 1500 tons per annum.
Tenders, stating price per ton delivered into Boat, to be addressed to the Manager not later than June 18, and marked "Tender for Tar."
The Committee do not bind themselves to accept the highest or any tender.
GEO. WINSTANLEY,
Manager.
Gas-Works, Coventry,
June 7, 1894.

LEEK IMPROVEMENT ACT, 1855.

TO TAR DISTILLERS AND OTHERS.

TENDERS are invited for the purchase of the surplus GAS TAR produced at the Leek Gas-Works, for One Year, from the 1st of July, 1894, at per ton of 2240 lbs. at such Works.
Endorsed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, by Four o'clock in the Afternoon of Monday, the 18th of June inst.
Forms of Tender and further Particulars may be obtained from the undersigned.
The highest or any tender will not necessarily be accepted.
By order of the Commissioners,
C. HENSHAW,
Clerk.
Town Hall, Leek,
June 6, 1894.

TIPTON GAS-WORKS.

TAR CONTRACT.

THE Gas Committee of the Tipton Local Board invite TENDERS for the purchase of the surplus TAR produced at the above Works, during a period of One, Two, or Three Years from the 1st of July next.
Particulars may be obtained at the Gas-Works, on application to Mr. Vincent Hughes, the Engineer and Manager.
The Tar may be delivered either into Boats or on Rail (L. & N.W.R.), as may be required.
Sealed and endorsed tenders to be sent to me the undersigned, not later than Ten a.m., on Saturday, the 23rd inst.
The Committee do not bind themselves to accept the highest or any tender.
By order,
GEO. M. WARING,
Clerk to the Board.
Public Offices, Tipton,
June 5, 1894.

TIPTON GAS-WORKS.

COAL CONTRACTS.

THE Gas Committee of the Tipton Local Board are prepared to receive TENDERS for the supply of GAS COAL for a period of One, Two, or Three Years, from the 1st of July next, in annual quantities of about 10,000 tons, to be delivered, carriage free, to the Gas-Works Siding (L. & N.W.R.).
Specification and Form of Tender may be obtained at the Gas-Works, on application to Mr. Vincent Hughes, the Engineer and Manager.
Sealed and endorsed tenders to be sent to me the undersigned, not later than Ten a.m. on Saturday, the 23rd inst.
The Committee do not bind themselves to accept the lowest or any tender.
By order,
GEO. M. WARING,
Clerk to the Board.
Public Offices, Tipton,
June 5, 1894.

KNARESBOROUGH LOCAL BOARD.

THE Gas Committee of the above Board invite TENDERS for the purchase of the surplus TAR and LIQUOR produced at their Works, the same to be delivered in Buyer's Tanks at the Railway Station, Knaresborough.
Price per ton for Tar (separate). Price per ton for Liquor per degree Twaddel, from 5° upwards.
Coal Carbonized, about 2000 tons per annum.
The Committee also invite TENDERS for the supply of from 50 to 100 tons of good LIME, free from Dirt and Ashes, delivered fresh at Knaresborough Station.
Also for the supply of the under-mentioned Sundries—
RED OXIDE PAINT, RED AND WHITE LEAD, OILS,
BRUSHES, SPUN YARN,
WROUGHT-IRON PIPES, AND TUBING (STEAM),
SHOVELS, FORKS, TOOLS, AND LEAD PIPE.
Tenders, endorsed under the different headings, "Tar and Liquor," "Lime," "Paints and Oils," and "Sundries," to be sent to the Chairman of the Gas Committee not later than Wednesday, the 27th of June, 1894.
The Committee do not bind themselves to accept the lowest or any tender.
No Forms of Tender.
T. SETTLE.
Gas-Works, Knaresborough,
June 7, 1894.

THE Selby Local Board of Health invite TENDERS for the supply of about 2000 tons of best screened GAS COAL for a period of One Year, commencing July 1, 1894, to be delivered at the Gas-Works Siding, Selby.
For Particulars and Forms of Tender, apply to the undersigned, to whom sealed and endorsed tenders must be sent on or before June 20, 1894.
J. S. NAYLOR,
Manager.
Gas-Works Offices, Selby,
June 5, 1894.

BOROUGH OF EVESHAM.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Corporation invite Tenders for the supply of from 500 to 1500 tons of best screened GAS COAL during the Year ending the 30th of June, 1895, to be delivered on Rail at Evesham.
Tenders to be sent in to me not later than the 22nd of June inst.
The Corporation do not bind themselves to accept the lowest or any tender.
THOS. COX,
Town Clerk.
Town Clerk's Office, Evesham,
June 1, 1894.

'TENDERS FOR GAS COAL.

THE Corporation of Droitwich invite TENDERS for the supply of from 700 to 900 tons of best screened GAS COAL, to be delivered free at Droitwich (G.W.) Railway Station, at such times and in such quantities as may be required, prior to the 31st of May, 1895.
Particulars and Form of Tender may be obtained on application to the Manager of the Gas-Works.
Sealed tenders, on the form provided for the purpose (with the Analysis of the Coal to be supplied), endorsed "Tender for Gas Coal," to be sent to the undersigned on or before the 23rd inst.
The Corporation do not bind themselves to accept the lowest or any tender.
S. JOHN TOMBS,
Town Clerk.
Droitwich, June 4, 1894.

TO SULPHURIC ACID MAKERS.

THE Directors of the Isle of Thanet Gas Company are prepared to receive TENDERS for the supply of best 80 per cent. BRIMSTONE ACID (Specific Gravity, 1710/20), during the ensuing Twelve Months, in lots of about 25 tons; the estimated total requirements being about 125 tons.
The Acid to be delivered in Carboys; and tenders should give alternative rates for delivery either f.o.b. Barge in Thames or to the Railway Station, specifying whether L.C. & D.R. or S.E.R., or Quayside at Margate.
Any further Information as to mode of delivery, &c., will be furnished, on application to the Manager of the Company, Mr. H. H. Jones.
Tenders, marked "Acid," to be addressed to the Chairman of the Company, and delivered on or before Thursday, June 21.
The Directors do not bind themselves to accept the lowest or any tender.
By order,
THOS. C. FULLER,
Secretary.
Gas-Works, Margate,
June 9, 1894.

SPALDING GAS-WORKS.

THE Spalding Improvement Commis- sioners invite TENDERS for the supply of 2000 tons of the best NEWCASTLE GAS COAL, and 500 tons of the best screened SILKSTONE GAS COAL or NUTS (or any larger quantity of either kind that may be required), to be delivered in such quantities as shall be from time to time required and ordered by them, or by their direction, up to the 30th day of June, 1895.
Sealed tenders, to be endorsed "Tender for Coals," stating the price per ton delivered f.o.b. in the Tyne, or at the Spalding Railway Station, to be sent to the undersigned, at the Office of the Commissioners, 8, Double Street, Spalding, on or before the 25th day of June inst.
The Commissioners will also receive TENDERS at the same time for the supply of 20 tons, or any greater or less quantity that may be required, of LIME suitable for Gas Purification, to be from time to time delivered at the Spalding Gas-Works in such quantities as shall be from time to time required, up to the 30th day of June, 1895.
The Commissioners do not bind themselves to accept the lowest or any other tender.
H. H. HARVEY,
Clerk to the Commissioners.
Spalding, June 7, 1894.

OLDBURY LOCAL BOARD OF HEALTH.
(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply of about 7000 tons of well-screened GAS COAL, for delivery during the Year ending June 30, 1895, in such quantities and at such times as ordered.
The Coal must be of first-class quality, freshly wrought, and perfectly free from Bats, Pyrites, and other Foreign Matter.
Form of Tender and other Particulars can be obtained on application to the undersigned.
Tenders to state the price delivered (1) at the Great Western Railway, Oldbury; (2) London and North-Western Railway, Oldbury; and (3) London and North-Western Railway, Albion.
Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Coal," to be delivered to me not later than Saturday, June 16 next.
The Gas Committee do not bind themselves to accept the lowest or any tender, and reserve to themselves the right to apportion the whole quantity as they may think fit.
By order
A. COOKE,
General Manager.
Gas-Works, Oldbury,
June 2, 1894.

FROME GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the supply of from 500 to 4200 tons of best screened GAS COAL, to be delivered at the Gas-Works Siding, between July 1, 1894, and June 30, 1895.

Tenders to be sent to me not later than June 23, 1894, endorsed "Tender for Coal."

The Directors do not bind themselves to accept the lowest or any tender.

H. F. VINCENT,
Manager.

Gas-Works, Frome,
June 2, 1894.

THE Directors of the Ware Gaslight and Coal and Coke Company, Limited, invite TENDERS for the supply of from 900 to 1200 tons of EAST PONTOP, NEW PELTON, or PELAW MAIN GAS COALS, to be considered at their Meeting to be held on Tuesday, the 12th day of June next.

Full Particulars may be obtained on application to me the undersigned at my Office.

Dated this 29th day of May, 1894.

By order of the Board,
GEO. H. GISBY,
Secretary to the Company.

Baldock Street, Ware.

TENDERS FOR GAS COAL.

THE Directors of the Cheltenham Gas- light and Coke Company are prepared to receive TENDERS for the supply of GAS COAL for One Year from the 1st day of September next.

Particulars may be obtained from the undersigned, to whom the tenders must be delivered on or before Thursday, the 21st inst.

The Directors do not bind themselves to accept the lowest or any tender.

R. O. PATERSON,
Engineer.

Gas-Works, Cheltenham,
June 8, 1894.

FARNWORTH AND KEARSLEY GAS COMPANY.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Directors of the Farnworth and Kearsley Gas Company are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR, to be produced at their Works for One or Two Years from the 1st day of July next.

Sealed tenders, addressed to Thomas Morris, Esq., Chairman, to be delivered at the Gas Offices on or before Monday, the 25th of June next.

Further Particulars may be obtained from the undersigned.

THOMAS LEA SHEPPARD,
Manager.

Gas Offices, Cross Street, Farnworth,
June 8, 1894.

THE Hindley Local Board are prepared to receive TENDERS for the supply of GAS COAL, THROUGH and THROUGH, COBBLES, NUTS, SLACK, CANNEL, and LIME required at their Gas-Works during the ensuing Twelve Months, and also for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works during the ensuing Twelve Months.

Full Particulars with Forms of Tender can be obtained on application to Mr. Wm. Dickinson, Gas and Water Manager.

Sealed tenders, endorsed "Tender for Gas Coal, &c.," to be lodged with the undersigned not later than Monday, June 18, 1894.

By order,
STEPHEN HOLT,
Clerk to the Local Board.

Offices: Cross Street, Hindley,
June 1, 1894.

TENDERS FOR GAS COAL.

THE Directors of the Banbury Gas Com- pany are prepared to receive TENDERS for GAS COALS (in lots of 1000 tons and upwards), to be delivered by Rail on the Company's Sidings at Banbury, in equal monthly quantities, from July 1, 1894, to June 1, 1895.

The Coal to be clean, dry, and fresh worked.

Short weight or inferior quality to be allowed for.

Sealed tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be delivered, at the Office of the Company at Banbury, not later than Saturday, the 23rd day of June.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

W. R. COOPER,
Secretary.

Gas Office, Gas-Works, Banbury,
June 12, 1894.

HAYWARDS HEATH GAS COMPANY, LTD.

GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 1500 tons of GAS COAL, to be delivered in such quantities and at such periods as may be ordered, until the 30th of June, 1895.

The Coal required is to be unscreened, and to be delivered, in Trucks, free at the Haywards Heath Railway Station, L.B. & S.C.R., either from the South Yorkshire or Durham Coal-Fields.

Payments: Net Cash, Monthly.

Tenders are to state the name of the Pits from which the above description of Coal will be supplied; the same to be Fresh Wrought, and free from Slate, and to the entire satisfaction of the Company's Manager.

The Board have no special Form of Tender, and do not bind themselves to accept the lowest or any tender.

Tenders are to be received by me on or before the 23rd day of June next, and endorsed "Tender for Gas Coal."

(Signed) ARTHUR H. CÆSAR,
Secretary.

85, Gresham Street, London, E.C.

PONTYPRIDD LOCAL BOARD (GAS).

TENDERS FOR MAINS AND SPECIALS.

THE Gas Committee invite Tenders for the supply of 3-inch, 4-inch, 6-inch, 10-inch, 12-inch, and 18-inch MAINS and SPECIALS.

Specification and Form of Tender may be obtained on application to Mr. H. Barker, Manager, Gas-Works, Pontypridd.

Tenders, sealed and endorsed "Tender for Pipes," to be sent to the undersigned not later than Tuesday, the 26th of June, 1894.

The Committee do not bind themselves to accept the lowest or any tender.

HENRY LL. GROVER,
Clerk to the Board.

Pontypridd, June 6, 1894.

CORPORATION OF LANCASTER GAS DEPARTMENT.

TENDERS FOR GAS COAL.

THE Gas Committee are prepared to receive TENDERS for the supply of screened GAS COALS, delivered on the Gas-Works Siding, Lancaster, in such quantities and at such times as may be required, during a period of One, Two, or Three Years, commencing delivery Sept. 1 next.

Sealed tenders, endorsed "Gas Coal," giving full particulars of the Coal offered, must be delivered to W. O. Roper, Esq., Town Clerk, Lancaster, on or before the 18th day of June next.

Forms of Tender may be obtained on application to the undersigned.

The lowest or any tender not necessarily accepted.

CHAS. ARMITAGE.

Gas-Works, Lancaster,
May 28, 1894.

ROCHESTER, CHATHAM, AND STROOD GAS-LIGHT COMPANY.

SUPPLY OF COALS.

THE Directors invite Tenders for the supply of about 40,000 tons of GAS COALS, to be delivered between the 1st of August, 1894, and the 31st of July, 1895.

Further Particulars with Forms of Tender and Contract may be had on application.

Sealed tenders, marked "Coals," are to be delivered to me at these Offices not later than Noon of Thursday, the 28th of June, 1894.

J. M. VEEVERS,
Engineer and Secretary.

Gas Offices: 58, High Street, Rochester,
May 31, 1894.

COUNTY BOROUGH OF BURY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Corporation of Bury are prepared to receive TENDERS for the supply of GAS COAL and CANNEL for a period of Nine Months, commencing on the 1st day of October, 1894, to be delivered free at the Corporation Siding, Bury, in equal monthly quantities.

Estimated quantities about 16,000 tons of Coal, and 1500 tons of Cannel.

Full Particulars and Form of Tender may be obtained on application to Mr. W. H. S. Gendall, Engineer and Manager, Gas-Works, Elton, Bury.

Sealed tenders, endorsed "Tender for Coal and Cannel," to be sent to me, the undersigned, on or before June 23, 1894.

The Corporation do not bind themselves to accept the lowest or any tender.

JOHN HASLAM,
Town Clerk.

Corporation Offices, Bury,
June 1, 1894.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gas- light Company invite TENDERS for the supply of about 12,000 tons of screened GAS COALS, and about 1000 tons of good ENGLISH CANNEL, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year commencing July 1, 1894, and ending June 30, 1895.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any tender.

Tenders must be made on Forms (containing further particulars), which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 22nd day of June, 1894.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Secretary and Manager.

Gas-Works, Shrewsbury,
May 22, 1894.

UFFCULME GAS COMPANY, LIMITED.

THE Directors of the Uffculme Gas Com- pany, Limited, invite TENDERS for the purchase of their FREEHOLD PREMISES, together with the whole of the PLANT, MACHINERY, and STOCK IN TRADE, with the GOODWILL as a going Concern, and including the GOODWILL and STOCK IN TRADE of the Business of COAL MERCHANTS also carried on by the Company.

The Purchaser will also have the option of taking off the Book Debts.

To view, apply to the Secretary, Mr. John Thorn, Uffculme, Cullompton; and for further Particulars apply to the Secretary or to the undersigned Solicitor, at whose Offices the Conditions of Sale may be seen.

Sealed tenders should be sent not later than the 19th day of June, 1894, to the Secretary or to the undersigned.

The Directors do not bind themselves to accept the highest or any tender.

E. LEE MICHELL,
Solicitor.

Wellington, Somerset,
May 24, 1894.

LONGWOOD GAS COMPANY.

TAR AND LIQUOR.

THE Directors of the above Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Works during the Year commencing July 1, 1894.

The Liquor to be 5° Twaddel.

The estimated quantity for disposal is about 950 tons.

Sealed tenders, endorsed "Tar and Liquor," addressed to the Chairman, Gas Offices, Longwood, Huddersfield, to be sent in not later than Wednesday, June 20, 1894.

JOHN LOWE MITTON,
Manager and Secretary.

NEWARK GAS COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of the Newark Gas Com- pany are prepared to receive TENDERS for the purchase of the surplus TAR, produced at their Works, free on rail G.N.R. or M.R., in Purchaser's Tanks, for One Year from the 1st day of July, 1894.

Terms: Cash Monthly.

Further Particulars can be obtained on application to the undersigned, to whom sealed tenders are to be sent on or before the 18th inst., marked on the outside "Tender for Tar."

The Directors do not bind themselves to accept the highest or any tender.

By order,
F. B. FOOTTIT,
Secretary.

Newark, June 4, 1894.

COUNTY BOROUGH OF WEST BROMWICH.
(GAS DEPARTMENT.)

TO COLLIERY PROPRIETORS.

THE Gas Committee are prepared to receive TENDERS for the supply of 22,000 tons of best screened GAS COAL, for use at their Works Albion, West Bromwich.

The Committee do not bind themselves to accept the lowest or any tender; and they reserve to themselves the right to divide the contract between several Firms.

Forms of Tender may be obtained upon application to Mr. Littlewood, Manager of the Works.

Sealed tenders, properly endorsed, to be delivered to me not later than Twelve o'clock Noon, on Friday, June 22.

By order,
THOS. HUDSON,
Secretary.

Town Hall, West Bromwich,
June 5, 1894.

THE Middleton Corporation are pre- pared to receive TENDERS for the supply of GAS COAL and CANNEL, delivered, at the Middleton Railway Station, in such quantities and at such times as the Corporation or their Gas Manager may require.

Tenders, addressed to the Chairman of the Gas Committee, must be delivered at my Office on or before Wednesday, the 20th of June, and be endorsed "Tender for Coal" or "Cannel."

The Corporation do not bind themselves to accept the lowest or any tender.

Further Particulars and Form of Tender may be obtained, by written application only, to Mr. Duxbury, Gas Manager.

FREDERICK ENTWISTLE,
Town Clerk.

Town Hall, Middleton,
June 6, 1894.

COMMERCIAL GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 180,000 tons of clean, dry, unscreened, fresh-wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port, during the Year ending the 31st of July, 1895.

The deliveries to be in equal monthly quantities throughout the Year.

Payment in cash monthly.

Parties desiring to tender for more than One Year must state separately the price and quantity offered for each Year.

Particulars and Forms of Contract may be obtained from the Engineer, Mr. H. E. Jones.

The Directors do not bind themselves to accept the lowest or any tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Twelve o'clock on the 20th of June, 1894.

Commercial Gas-Works, Stepney, E.,
May 24, 1894.

EAST LONDON WATER-WORKS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS in respect of the DEBENTURE STOCK only WILL BE CLOSED on the 18th of June inst. and re-opened on the 2nd day of July, 1894.

I. A. CROOKENDEN,
Secretary.

St. Helen's Place, London, E.C.,
June 9, 1894.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company so far as they relate to DEBENTURE STOCK and BONDS, WILL BE CLOSED at Ten o'clock forenoon, on Thursday, the 14th inst., for the Half Year ending on the 30th of June 1894, and will be re-opened on Monday, the 18th inst.

The Interest for the Half Year will be payable on the 1st day of July next to the Proprietors registered on the closing of the Books.

By order of the Board,
JAMES RANDALL,
Secretary.

Gas Offices: Willoughby Lane,
Tottenham, June 12, 1894.

TO GASHOLDER MAKERS.

THE Gas Committee of the Todmorden Local Board are prepared to receive TENDERS and DESIGNS for the construction and erection of a WROUGHT-IRON TANK and TELESCOPIC GAS-HOLDER; the Tank to be 134 ft. 6 in. diameter and 25 ft. deep. The Gasholder to be two Lifts, prepared for a third.

Full Particulars may be had, and the Site inspected, from the 11th to the 18th of June, on application to the undersigned.

Sealed tenders, endorsed "Tender for Gasholder and Tank," to be sent in not later than Six p.m., on Tuesday, the 26th inst., addressed to the Chairman of the Gas Committee, Town Hall, Todmorden.

By order,
GEORGE E. SAVILLE,
Engineer and Manager.

Gas-Works, Todmorden,
June 7, 1894.

N.B.—No allowance for tender, nor pledge to accept the lowest or any tender.

By Order of the Directors.—Important Sale of £7500 4 per cent. Perpetual Debenture Stock, in that prosperous Undertaking the Southend Gas Company, to be created and issued under the Provisions of the Southend Gas Act, 1892. The Ordinary Shares of the Company have paid 10 per cent. and 7 per cent. respectively for many years past; and this Debenture Stock therefore forms an investment of the very highest character.

MR. ALFRED RICHARDS will sell the above BY AUCTION, at the Mart., E.C., on Tuesday, June 19, at Two o'clock precisely, in Lots.

Particulars of J. T. RANDALL, Esq., Secretary, High Street, SOUTHEND; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BROMLEY GAS CONSUMERS' COMPANY.

SALE BY AUCTION OF 500 ORDINARY SHARES OF £10 EACH.

THE Directors give notice that they have instructed Messrs. Baxter, Payne, and Lepper to sell BY AUCTION, at the Bell Hotel, Bromley, Kent, on Wednesday, the 20th of June, 1894, at Eight o'clock p.m. precisely, in Lots of Five and Ten Shares each, 500 ORDINARY SHARES of £10 each in the Bromley Gas Consumers' Company.

The Dividend paid upon this class of Shares for the past Three Years has been at the rate of 8½ per cent. per Annum.

Particulars and Conditions of Sale may be obtained of the SECRETARY of the Company; Messrs. WILLETT AND LATTER, Solicitors, Market Square, Bromley, KENT; and of the AUCTIONEERS, Market Square, Bromley, KENT.

By order,
H. W. AMOS,
Secretary.

Bromley, Kent
May 30, 1894.

AMMONIA SATURATORS.

TO GAS ENGINEERS, SULPHATE OF AMMONIA MANUFACTURERS, ETC.

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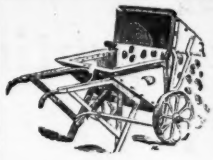

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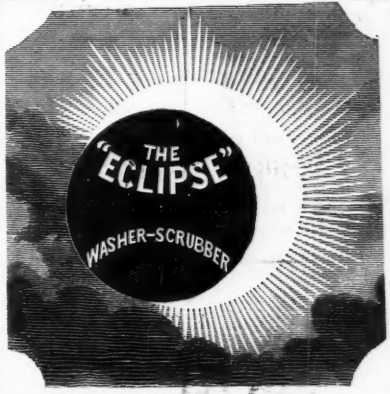

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	Per Cent.
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Hydrogen	5·116
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Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
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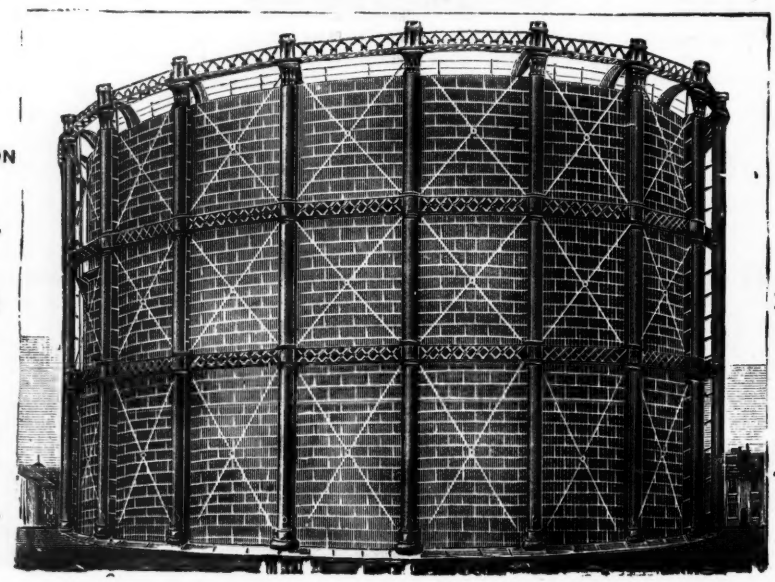

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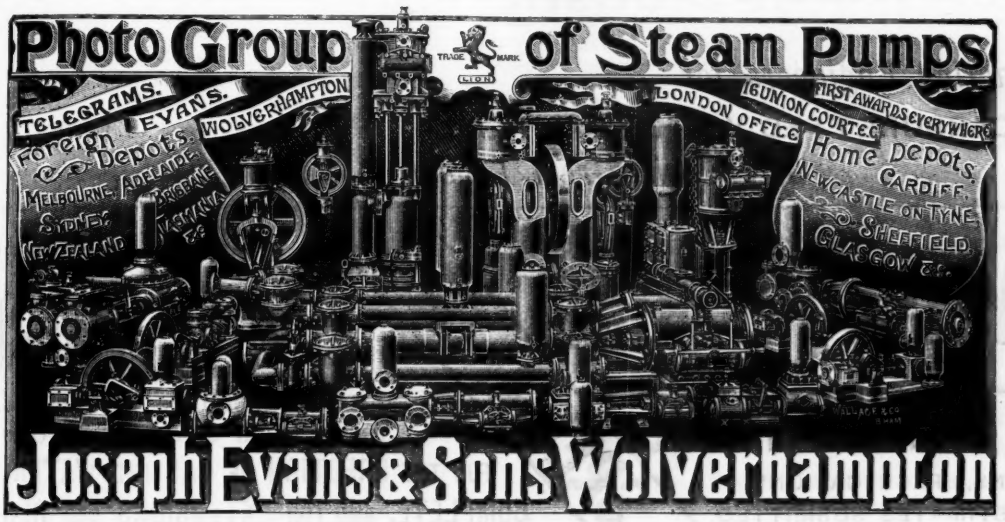

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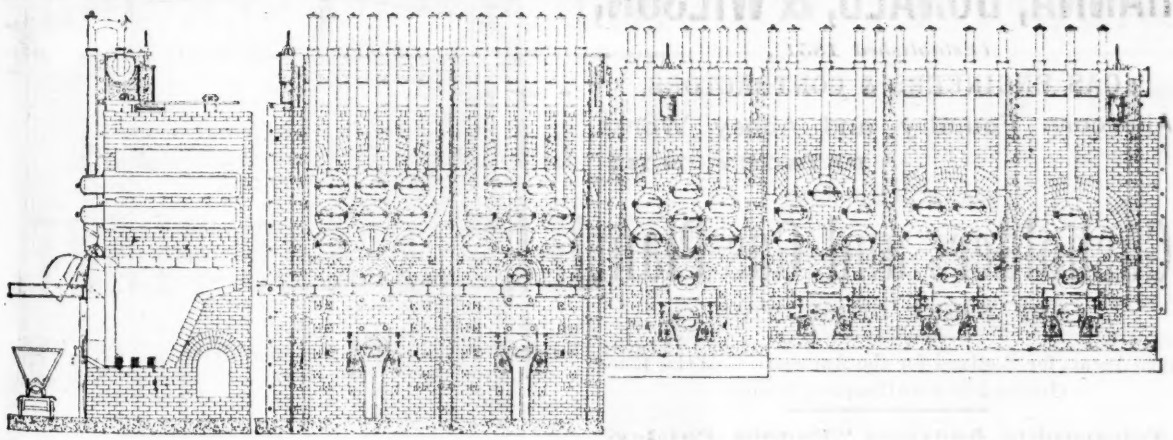

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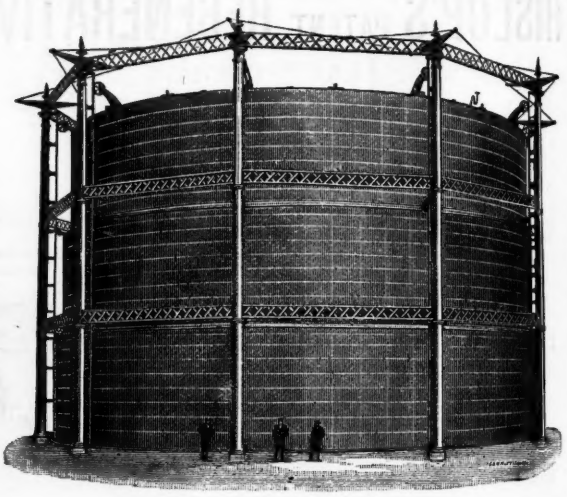

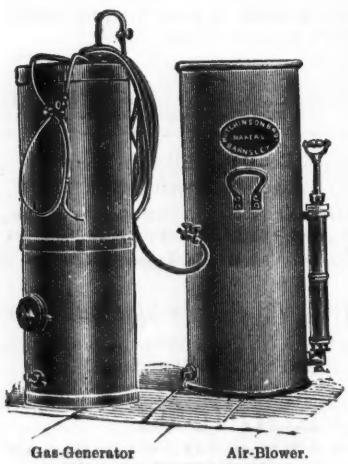

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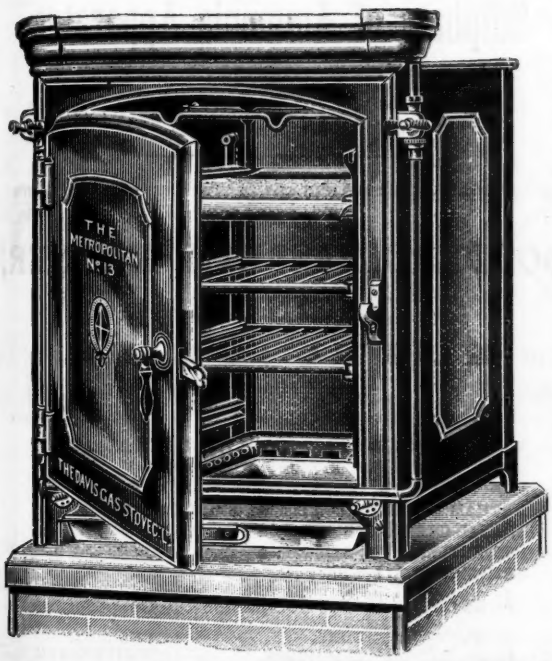

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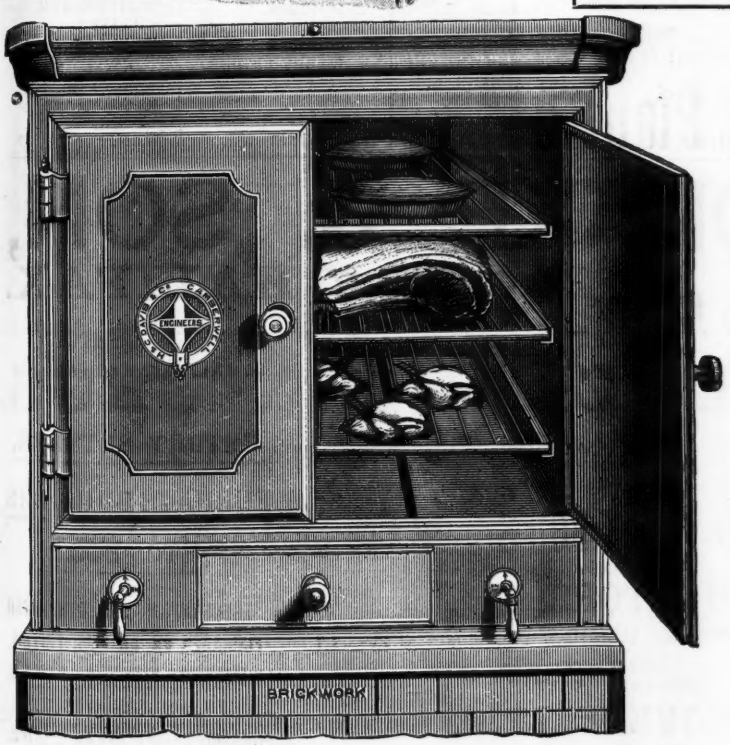

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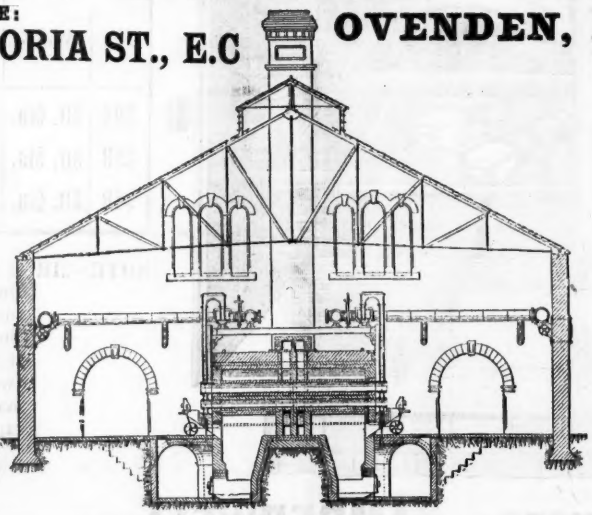

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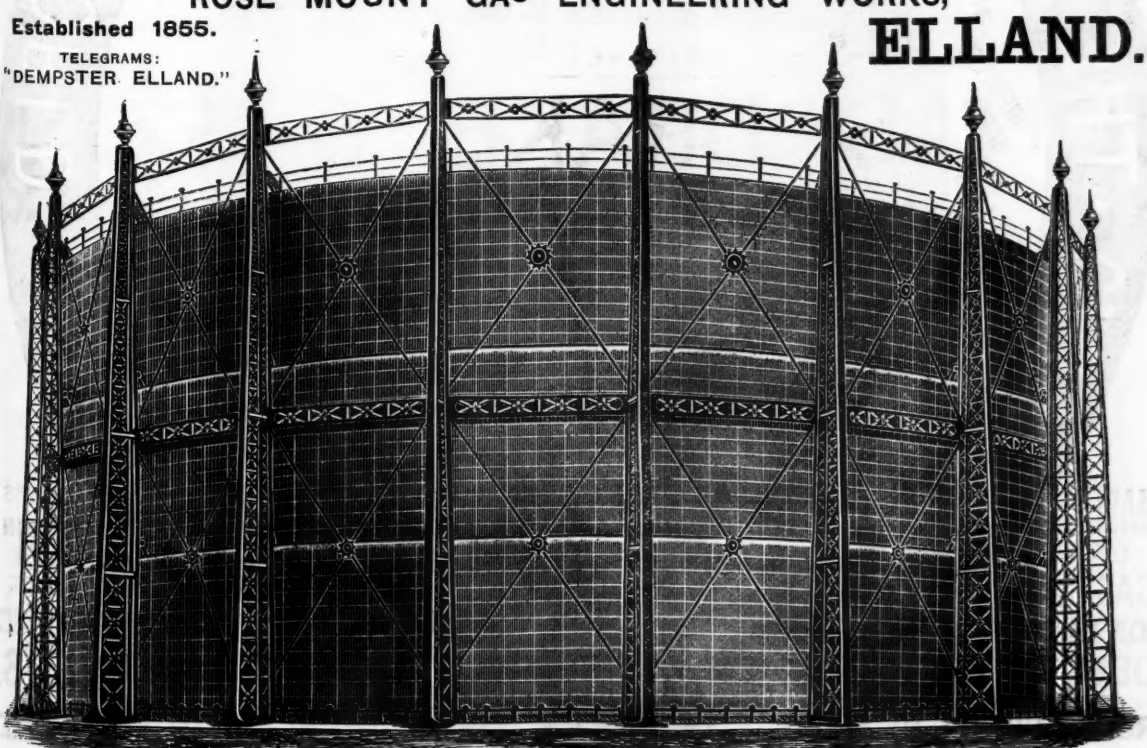

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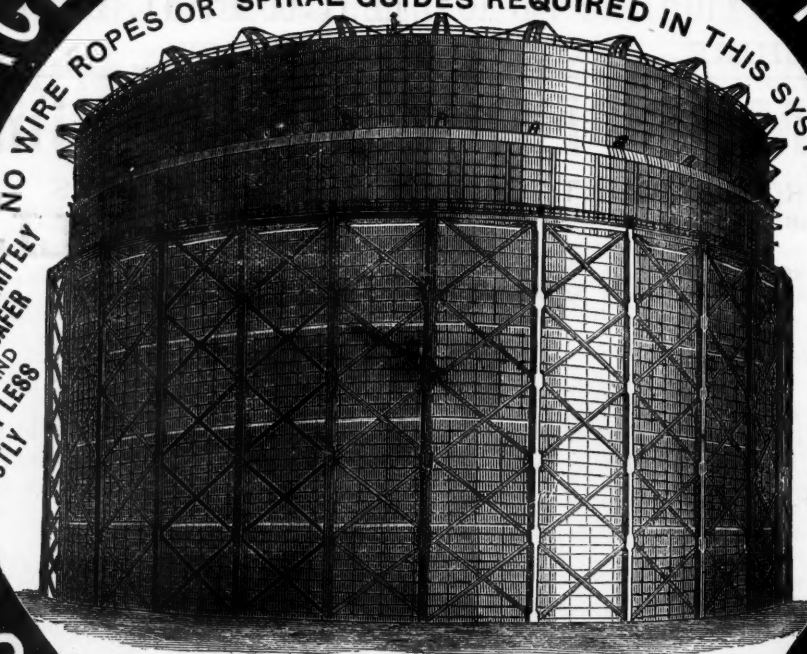

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[See Illustrated Advertisement, June 5, p. 1094.]

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See Illustrated Advertisement, p. II. Centre of JOURNAL for June 5.

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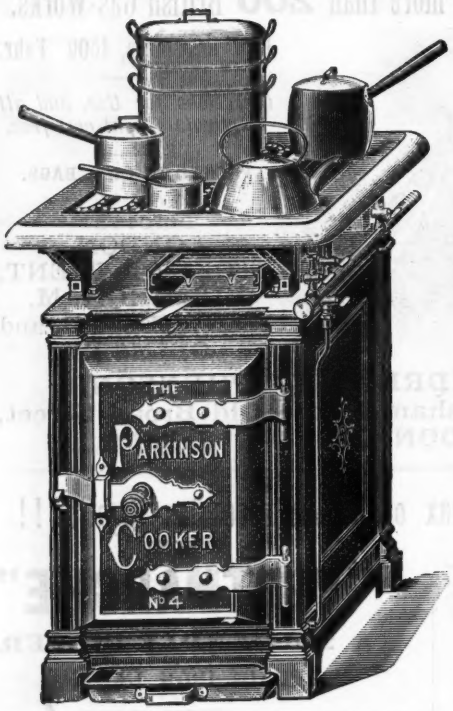

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"It is easy to manage, very good in its results, and most economical in the consumption of gas. Pastry, bread, cakes, and meat are all equally well cooked and beautifully browned in the oven. The grilling, boiling, and simmering arrangements are perfect."

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[See also Advt. p. 1106.

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